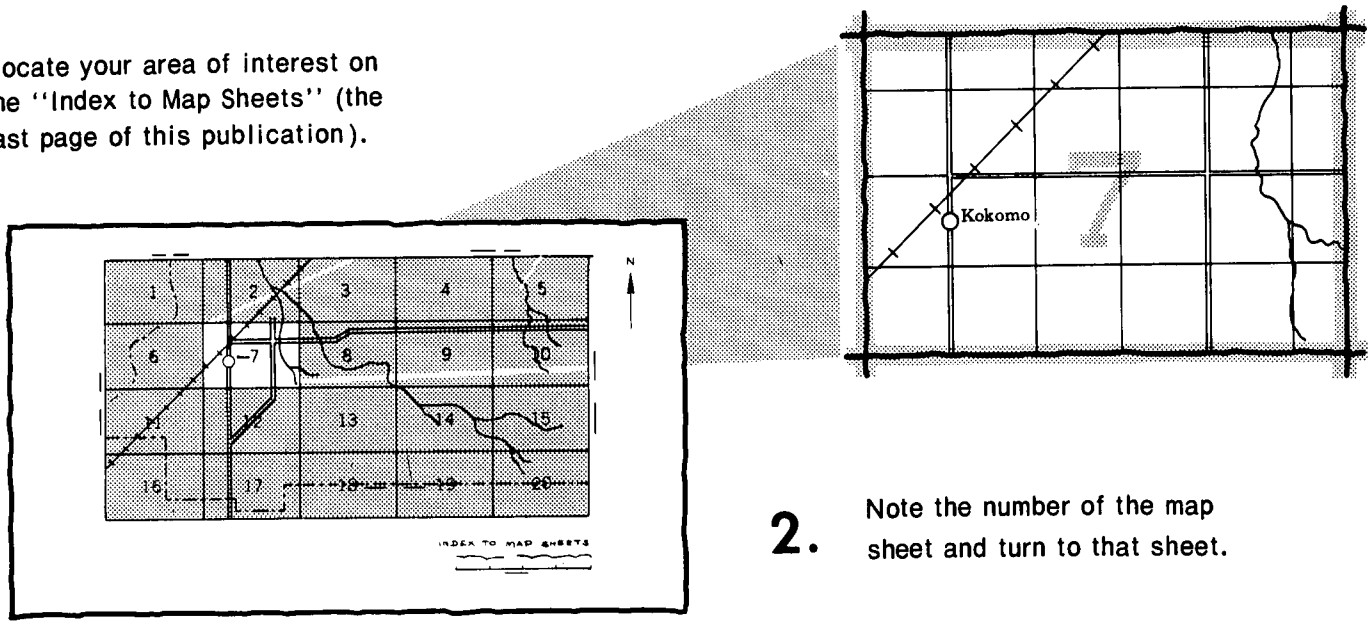
SOIL SURVEY OF

Union and Webster Counties Kentucky

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Kentucky Department for Natural Resources and
Environmental Protection and
Kentucky Agricultural Experiment Station

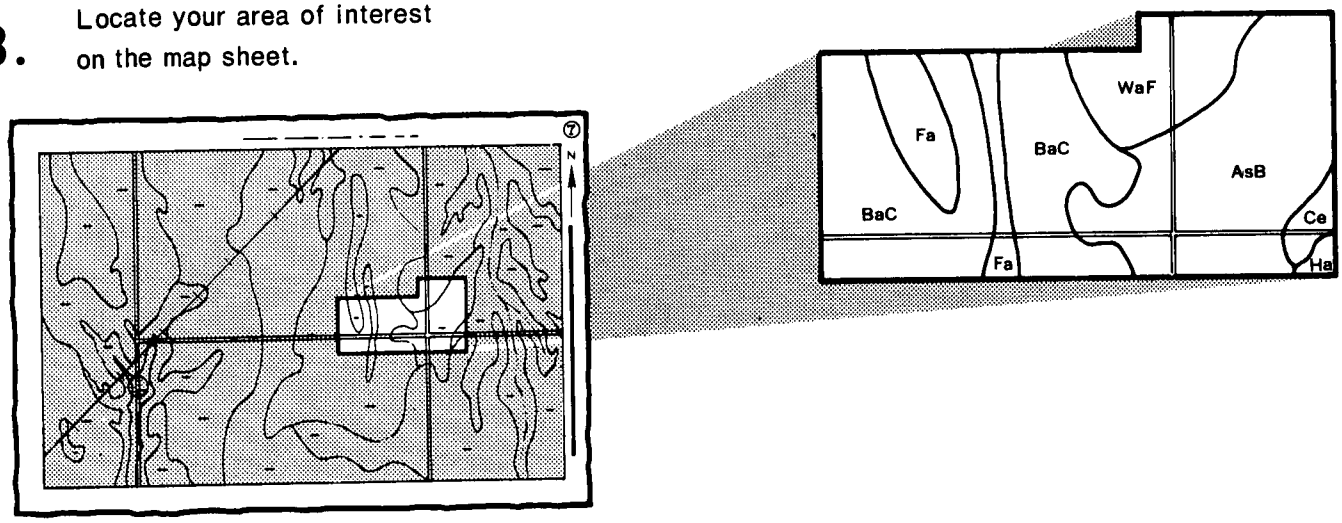
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

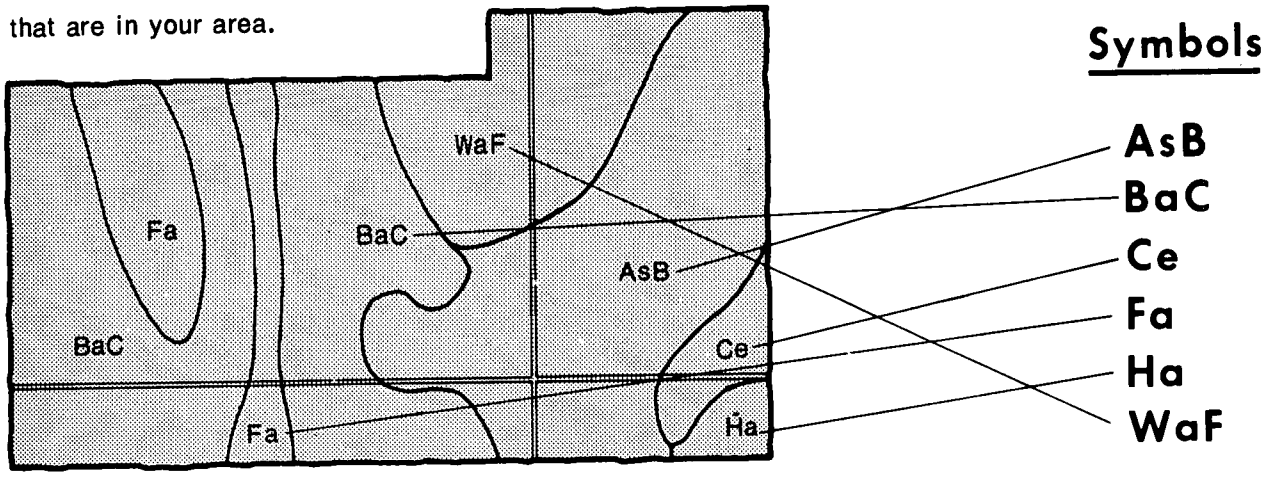


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

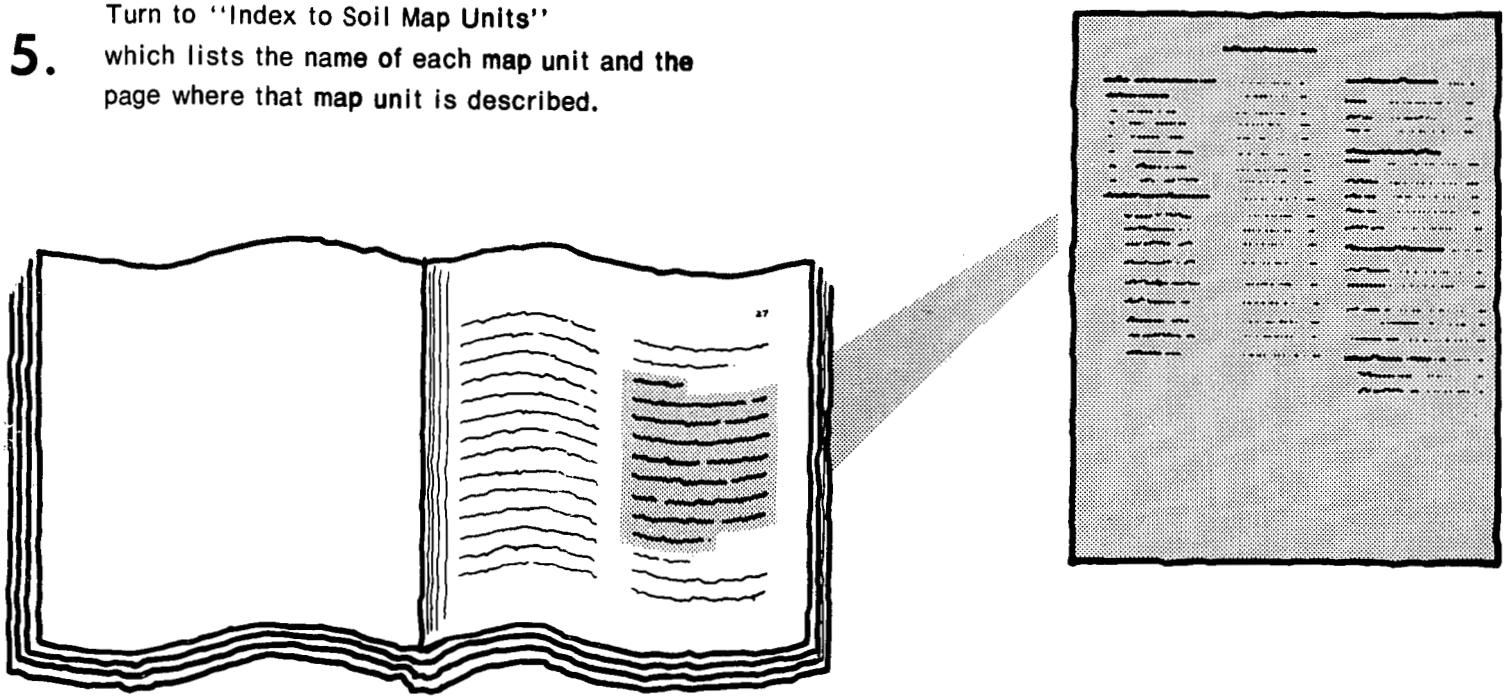


4. List the map unit symbols that are in your area.

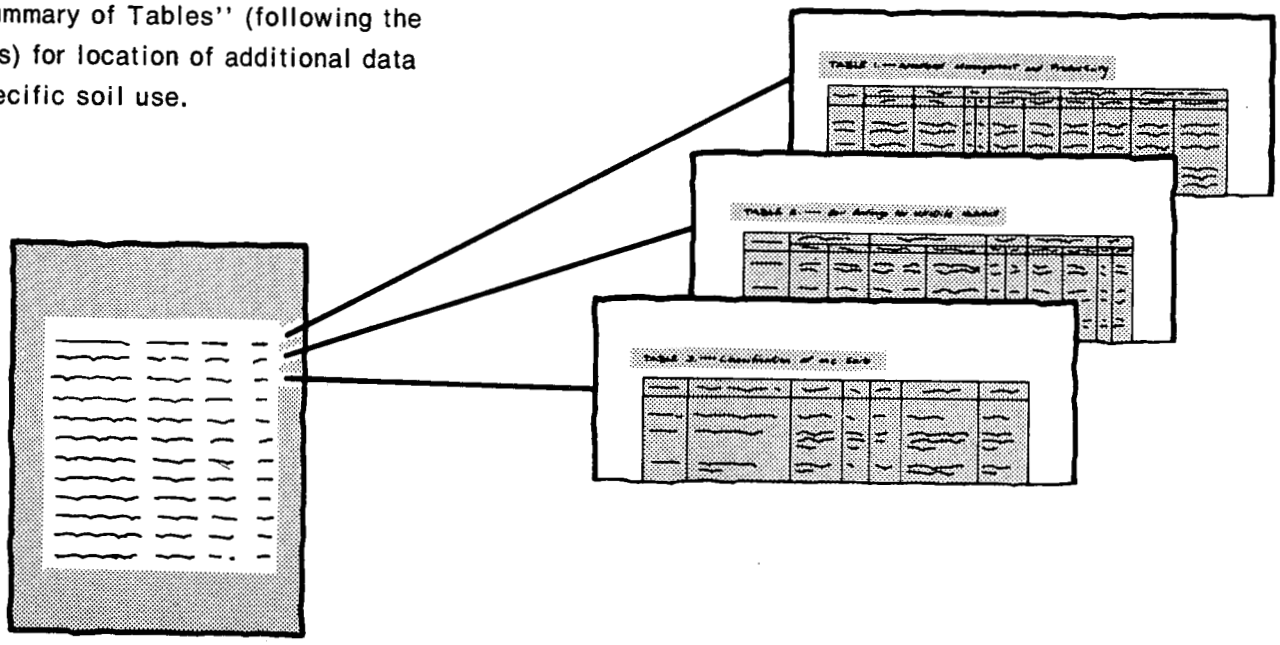


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1970-1977. Soil names and descriptions were approved in 1978. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978. This survey was made cooperatively by the Soil Conservation Service, the Kentucky Department for Natural Resources and Environmental Protection, and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the Union and Webster Counties Conservation Districts.

Cover: Permanent pasture of Wellston silty clay loam, 12 to 20 percent slopes, severely eroded, in the foreground. Corn, soybeans, and wheat on areas of Memphis, Uniontown, and Wakeland soils in the background.

contents

soil series

Issued January 1981

index to map units

summary of tables

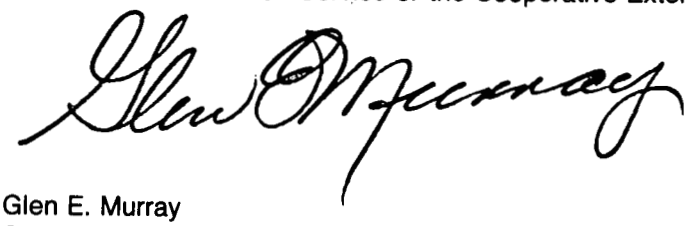
foreword

This soil survey contains information that can be used in land-planning programs in Union and Webster Counties. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

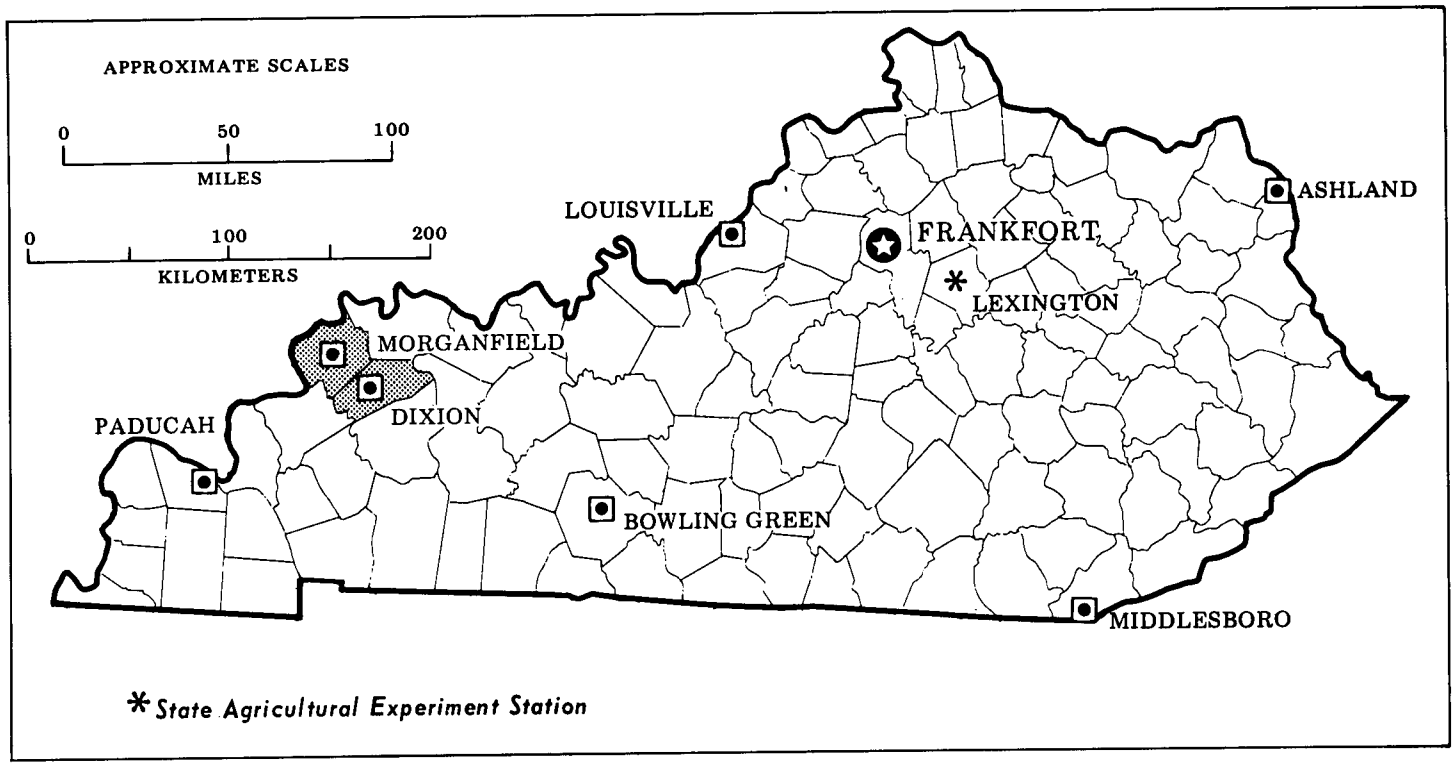
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil maps. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



Glen E. Murray
State Conservationist
Soil Conservation Service



Location of Union and Webster Counties in Kentucky.

soil survey of
Union and Webster Counties, Kentucky

By Eullas H. Jacobs, Soil Conservation Service

Fieldwork by Eullas H. Jacobs and David Keltner,
Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with Kentucky Department
for Natural Resources and Environmental Protection
and the Kentucky Agricultural Experiment Station

UNION AND WEBSTER COUNTIES are in the northwestern part of Kentucky. Union County is bounded on the north and west by the Ohio River, on the southeast by the Tradewater River and Webster County, and on the east by Henderson County. Webster County is bounded on the north by Union and Henderson Counties, on the west by the Tradewater River, on the east by the Green River, and on the south by Hopkins County. There are 217,860 acres or 340 square miles in Union County, and 216,770 acres or 339 square miles in Webster County. Dixon is the county seat of Webster County, and Morganfield is the county seat of Union County.

These counties are in the Western Coal Field physiographic region of Kentucky. The highest elevation in the area, in the central part of Union County, is about 670 feet. The lowest elevation, in the southwestern part of Union County, is about 330 feet. Drainage is to the north and west.

Relief ranges from nearly level to steep. Most of the steep areas are in the central part of the survey area. Wide valleys are in the eastern and western parts. Nearly level to sloping, well drained to poorly drained soils that formed in alluvium are on the valley floors. A large part of Union County is within the Ohio River flood plain.

Farming has been an important economic value in Union and Webster Counties since the first settlement. Corn, soybeans, hay, and pasture are the main crops. Hogs and beef cattle are the most commonly raised livestock. Coal mining and its supporting industries are the major sources of nonfarm income. Numerous manufacturing plants have moved into and around the survey area since about 1965. This industrial development has added greatly to the local economy.

A previous soil survey of Union County was published in 1902 (*10*). The present survey updates the first survey and provides additional information and larger maps that show the soils in greater detail.

general nature of the survey area

This section provides general information about Union and Webster Counties. It briefly describes the history of settlement and development; geology, relief, and drainage; farming; industry; natural resources; and climate.

history of settlement and development

Union County was formed from Henderson County in 1811. The first permanent settlement had been made about 1805. Before this, immigrants had visited the area, but they had traveled on farther west or had returned to their homes in the east. The earliest settlers were from Virginia, North Carolina, and other parts of Kentucky. They were made up of two groups. One group claimed land under army grants made by the Federal

Government for services during the Revolutionary War. The other group settled under the head-rights law. This law granted land to the settler who could prove that he had permanently settled and made improvements on the land he claimed.

Originally, the upland areas of Union County were covered with dense hardwood forests, and large areas of the lowlands were covered with cane. Wild game was abundant. The upland areas were settled before the lowlands because the stream bottoms were swampy. Forests were cleared, and corn and tobacco were grown. Corn was planted for food, and tobacco was sold for income. About the middle of the 1800's, wheat became an important crop. Once settlement had begun, the county developed rapidly. The raising of livestock, hogs, cattle, sheep, and draft animals became an important industry.

After the more desirable upland areas had been developed, the wet bottom lands were drained. These fertile areas were made productive through ditching and tile drainage (*10*).

Webster County was formed from Henderson, Union, and Hopkins Counties in 1860. It was named in honor of Daniel Webster. Dixon was incorporated as the county seat in 1861. It was named for Lieutenant Archibald Dixon.

At the time of settlement, Webster County was covered with forests of white oak, black oak, poplar, and sweetgum. Wild game was plentiful. Logs were rafted by the settlers to Evansville, Indiana, and to other places. Tobacco became an important crop. As early as 1870, most towns in the county had at least one factory to prepare the tobacco for market.

The first oil well in the area was drilled near Sebree in 1913. As late as 1952, Webster County was the largest producer of oil in Kentucky.

geology, relief, and drainage

Union and Webster Counties are in the Western Coal Field physiographic region of Kentucky. Sedimentary rock of Pennsylvanian age underlies the soils of the counties.

The rock of Pennsylvanian age consists of sandstone, siltstone, and shale. The Carbondale and Tradewater Formations are mostly of Middle Pennsylvanian age; the Henshaw, Lisman, and Sturgis Formations are of Upper Pennsylvanian age; and the Caseyville Formation, in the western part of the survey area, is of Lower Pennsylvanian age.

A layer of loess, or windblown silt, covers the uplands throughout the survey area. This layer ranges from 2 feet to more than 50 feet thick. It is thickest in the western and northern parts of Union County and thinnest in the southern and eastern parts of Webster County. In some steep areas, this layer of loess is very thin or is absent. In other steep areas, bedrock is exposed, and sandstone cliffs have formed.

Alluvium covers a fairly large part of the survey area. The flood plain of the Ohio River extends along the border of Union County for about 40 miles and is as much as 2 miles wide. Flood plains of the smaller streams are wide as compared to stream size. The alluvium, which is thickest near the Ohio River, ranges from 6 feet to more than 150 feet.

Soils of the uplands are undulating to steep. The undulating soils are mostly on low, loess-covered hills adjacent to wide valleys that are covered with alluvium. Elevation of these hills is commonly less than 40 feet.

A few hilly areas are in the western and south-central parts of Union County, but most of the hilly topography is in the central part of Webster County. These hills have narrow, winding tops. Side slopes are steep, and valleys are narrow (fig. 1). The elevation between the ridgetops and the valley floors differs as much as 240 feet, but it is mostly less than 200 feet.

Drainage in the survey area is generally to the north and southwest. The Ohio River, which forms the northern boundary of Union County, flows to the southwest. Other streams flow to the north and west into the Ohio River. The Green River, a tributary of the Ohio River, is the eastern boundary of Webster County. Highland Creek is the eastern boundary of Union County, and the Tradewater River is the southwestern boundary of both Union and Webster Counties. Other small streams and drainage ditches flow directly into the Ohio River.

farming

The sale of farm products accounts for much of the income in Union and Webster Counties. According to the United States Census of Agriculture (*22*), the principal crops in the survey area in 1974 were corn, soybeans, wheat, hay, tobacco, and woodland. A small acreage was in orchards. At present, corn and soybeans account for most of the income from crops. In most years, however, about one-third of the corn crop is kept on the farm and fed to livestock. Tobacco is an important cash crop in Webster County. Red clover, lespedeza, and timothy and other grasses are harvested for hay. A considerable acreage of fescue is grown. Fescue hay is made into round bales and left on the field for winter feeding.

In 1974, the principal kinds of livestock in the counties were cattle, hogs, sheep, and horses. Chickens were also raised. At present, most livestock are raised for sale, but some animals provide meat for home use.

In 1974, there were 522 farms in Union County, which averaged 388 acres. In Webster County, there were 698 farms, which averaged 236 acres. In recent years, however, the size of farms has increased because large scale farming is more economical than small scale farming. This trend is due to the increased use of large farm machinery. As a result, many small farms are being combined into larger units, and some small, hilly farms have been abandoned. Part-time farming is also

Figure 1.—Winter cornfield in narrow valley on Collins silt loam. In the background is Frondorf silt loam, 20 to 30 percent slopes, in native hardwoods.

increasing in Union and Webster Counties. Many people who live in the country now work in the city.

industry

In 1970 in Union County, residents were employed on farms, in forestry, fisheries, construction, and in manufacturing and mining industries. In Webster County, residents were employed on farms, in construction, and in manufacturing and mining industries (*21*).

At present, in addition to local industries, residents of Union and Webster Counties work in manufacturing plants in Evansville, Indiana, and Madisonville and Henderson, Kentucky, and in coal mines in nearby counties.

natural resources

Other than soil, the major natural resources in Union and Webster Counties are coal, petroleum, natural gas, sand and gravel, clay, and trees.

Coal is the principal natural resource. It was first mined in Union County about 1847 and in Webster County about 1890 and was obtained by shaft mining. About 3,700 acres in these counties has been surface mined. Most surface mines are near Providence, Clay, Sullivan, and De Koven, but at present only two or three small mines are still operating. Subsurface mines are near Lisman in Webster County and near Uniontown, Spring Grove, and in the Camp Breckinridge area in Union County. In Union County, conveyor belts as much as 12 miles long carry coal from the mines to barges on the Ohio River.

Oil production began about 1921 and has continued since that time. The largest oilfields are near Sebree in Webster County and near Uniontown in Union County. Natural gas, produced from most oil wells, is used locally or sold for commercial purposes. Some gas is burned at the well or released into the atmosphere.

Sand and gravel are dredged from the Ohio River. The sand is used for making concrete or in road construction.

Much of the gravel has been used for secondary roads and private driveways. A number of small abandoned gravel pits are east of Onton.

Deposits of fire clay generally lie beneath layers of coal in Union and Webster Counties. These deposits, however, have not been mined to any extent. Slack-water clay is also abundant, but it has not been used.

In the survey area, large tracts of wet lowlands and steep uplands are in woodland. According to the Conservation Needs Inventory, about 38,000 acres in Union County and 68,000 acres in Webster County are forest. Mixed stands of hardwoods are predominant, but several hundred acres have been planted in pine trees. A few small sawmills are still in operation (fig. 2).

The Ohio River is used for transportation, and it provides water for industrial and recreation uses. Locks and dams make the river navigable at all times. Use of the Ohio River and Green River for barge traffic, and for recreation purposes, such as boating, swimming, fishing, and water skiing, is inceasing. Sufficient quantities of water are available for most uses at a depth of about 30 feet in the Ohio River flood plain. Some wells in this area are used for irrigation. The Ohio River supplies water to the city of Uniontown and to the Camp Breckinridge Job Corps. Manmade lakes provide water for several towns in the counties. In the past, water for home use was obtained from wells and cisterns, but it is now piped into many areas. Ponds are used for watering livestock; for irrigating, fishing, and swimming; and for home supply. One lake (fig. 3) has been developed commercially for swimming, fishing, and camping.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

In Union and Webster Counties, Kentucky, summers are hot in the valleys and slightly cooler in the hills. Rain is fairly heavy and is well distributed throughout the year. Winters are moderately cold. Snow falls nearly every winter, but the snow usually lasts only a few days.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Henderson, Kentucky in the period 1951 to 1975. Table 2 shows probable

Figure 2.—Sawmill processing locally grown timber. A few small sawmills still operate in the survey area.

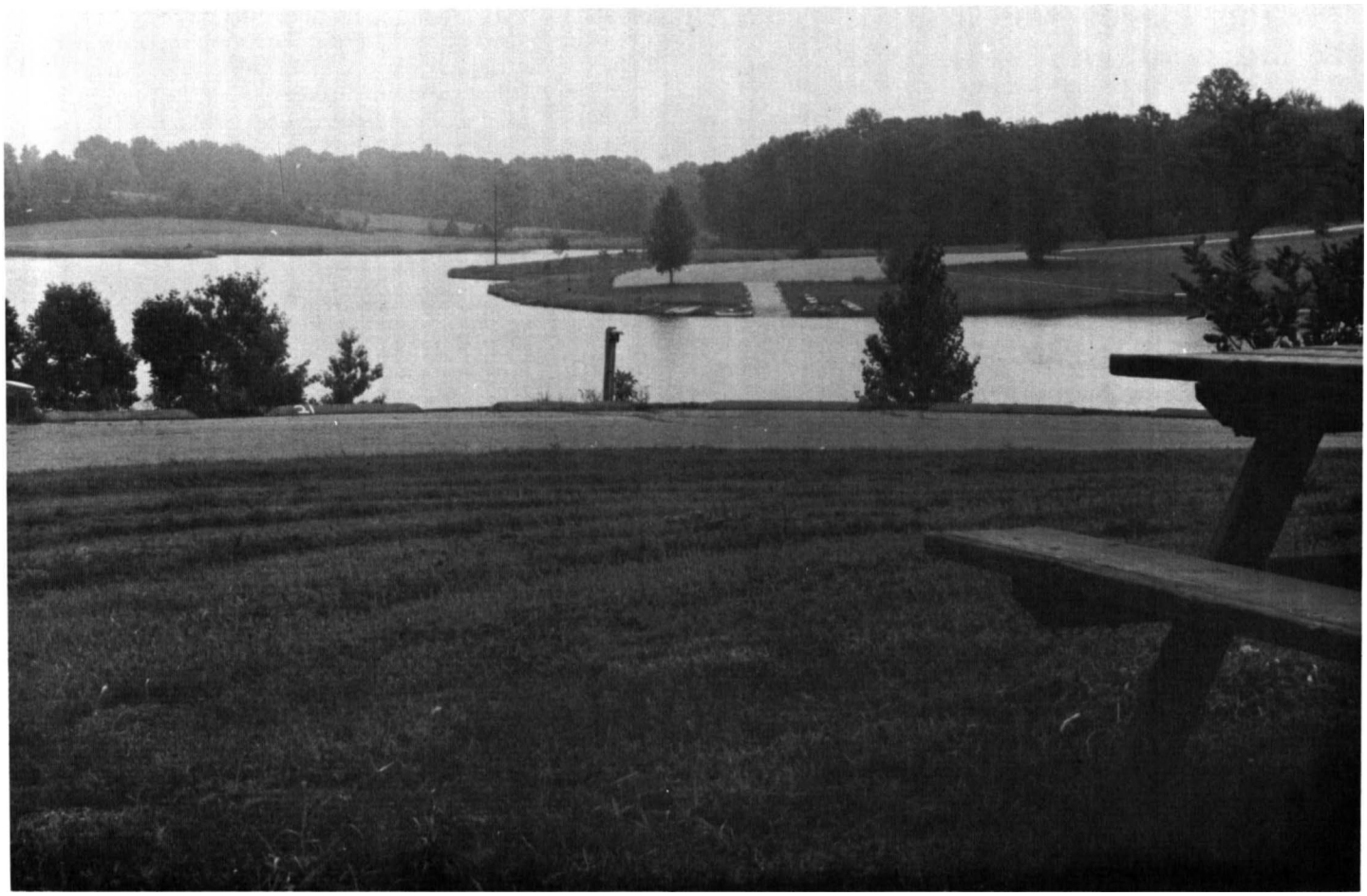


Figure 3.—A lake developed for recreation in an area of Memphis silt loam, 2 to 6 percent slopes, and Memphis silt loam, 6 to 12 percent slopes.

dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 37 degrees F, and the average daily minimum temperature is 28 degrees. The lowest temperature on record, which occurred at Henderson on January 24, 1963, is -15 degrees. In summer the average temperature is 76 degrees, and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred on July 13, 1966, is 106 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 23 inches, or 50 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 6.26 inches at Henderson on March 9, 1964. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is 14 inches. The greatest snow depth at any one time during the period of record was 11 inches. On an average of 7 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the south-southwest. Average windspeed is highest, 11 miles per hour, in March.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil maps at the back of this publication show broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil maps can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of their small scale, the maps are not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

general soil map units of Union County

1. Nolin-Huntington-Newark

Deep, nearly level, well drained and somewhat poorly drained, medium textured and moderately fine textured soils; on flood plains

This map unit is in the northwestern part of Union County on flood plains of the Ohio River. It is mostly less than 2 miles wide. The Wabash and Slim Islands are included in this unit.

This map unit makes up about 16 percent of Union County. It is about 24 percent Nolin soils, 16 percent Huntington soils, 13 percent Newark soils, and 47 percent soils of minor extent.

The well drained Nolin and Huntington soils are slightly higher in elevation than Newark soils. Nolin soils have a surface layer and subsoil of brown silty clay loam. Huntington soils have a surface layer and subsoil of brown silt loam and are generally adjacent to the river. The somewhat poorly drained Newark soils are in swales. They have a surface layer, subsoil, and substratum of brown silty clay loam. The subsoil has gray mottles in the upper part, and the substratum is dominantly gray.

Of minor extent are areas of well drained Robinsonville soils on low ridges and the moderately well drained Lindside soils and poorly drained Melvin soils on flood plains.

Most of the acreage in this map unit is used for corn and soybeans. A few areas are used for woodland. Flooding during the growing season occasionally damages cultivated crops. Recently, large areas have been cleared, and some have been drained. There are a few small swampy undrained areas. Pasture and meadow crops are planted on a very limited acreage because most areas are flooded in winter and early in spring. In some years, flooding lasts long enough to destroy pasture and meadow plants.

If adequately drained, this map unit is well suited to cultivated crops. The soils have poor suitability for urban uses and homesites because of the hazard of being flooded. They are suitable for some recreation uses. These soils have good potential as habitat for openland and woodland wildlife.

2. Melvin-Wheeling

Deep, nearly level to gently sloping, poorly drained and well drained, moderately fine textured soils; on flood plains and stream terraces

This map unit is in the northeastern part of Union County on the flood plain of the Ohio River. It is an area of long, narrow, wet swales separated by long, narrow, low ridges.

This map unit makes up about 4 percent of Union County. It is about 32 percent Melvin soils, 19 percent Wheeling soils, and 49 percent soils of minor extent.

The nearly level, poorly drained Melvin soils are on flood plains at the lowest elevation. They are silty clay loam throughout. These soils are flooded for brief periods in winter and in spring. The nearly level to sloping, well drained Wheeling soils are on ridges that are 4 to 6 feet higher in elevation than Melvin soils. They have a surface layer of silt loam, a subsoil of silty clay loam, and a substratum of fine sandy loam.

Of minor extent are areas of well drained Aston soils, moderately well drained Otwell soils, and somewhat poorly drained Weinbach soils on stream terraces, and areas of well drained Nolin soils and somewhat poorly drained Newark soils on flood plains.

The soils in this map unit are used mainly for cultivated crops and woodland. Most of the soils on ridges have been cleared and are used for corn or soybeans. Most swale areas are in woods. The hazard of flooding is the main limitation for farming and for most other uses. In addition, some areas of the Melvin soils are limited by wetness.

If adequately drained, this map unit is well suited to cultivated crops. Because flooding is such a severe limitation and so difficult to overcome, these soils have poor suitability for homesites and for most urban and recreation uses. Melvin soils have good potential for wetland wildlife habitat, and Wheeling soils have good potential for openland wildlife habitat.

3. Memphis-Wilbur-Wakeland

Deep, nearly level to steep, well drained to somewhat poorly drained, medium textured and moderately fine textured soils; on uplands and flood plains

Areas of this map unit are scattered throughout Union County. Typically, the landscape is an area of hilly uplands and long, narrow flood plains. The dominant soils on the uplands formed in loess. Soils on flood plains formed in loamy alluvium.

This map unit (fig. 4) makes up about 38 percent of Union County. It is about 59 percent Memphis soils, 9 percent Wilbur soils, 7 percent Wakeland soils, and 25 percent soils of minor extent.

The well drained Memphis soils are on long, winding, gently sloping hilltops and sloping to steep hillsides. They have a surface layer of silt loam and a subsoil and substratum of silt loam or silty clay loam. Severely eroded areas have a surface layer of silty clay loam. The moderately well drained Wilbur soils and the somewhat poorly drained Wakeland soils are on flood plains. These nearly level soils are silt loam throughout.

Of minor extent are areas of well drained Wellston soils on uplands, Uniontown soils on stream terraces, and Haymond soils on flood plains.

The soils in this map unit are used mainly for cultivated crops, pasture, and meadow. Most of the acreage has been cleared. Many steeper areas are severely eroded. Soils on flood plains are mainly limited by wetness and by flooding which occasionally occurs in winter and in spring for brief periods.

This map unit is well suited to cultivated crops if erosion is controlled and other good management practices are used. Many of the soils on uplands are suitable for homesites and for most urban and recreation

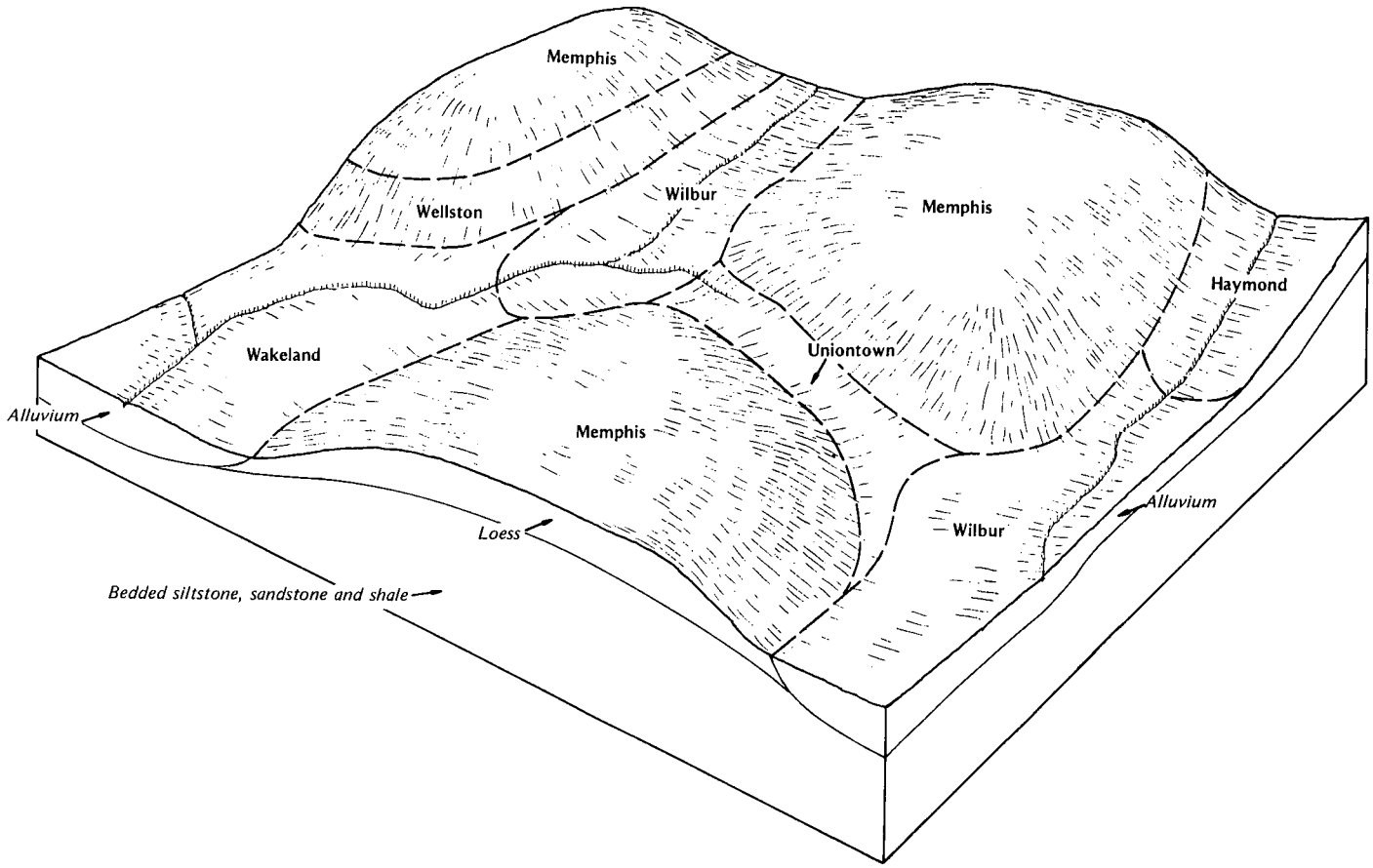


Figure 4.—Relationship of soils to topography and underlying material in the Memphis-Wilbur-Wakeland map unit, in Union County.

uses. Because of the hazard of being flooded and wetness, the soils on flood plains have poor suitability for most urban uses. These soils have good potential for the development of openland and woodland wildlife habitat.

4. Patton-Wilbur-Wakeland

Deep, nearly level, moderately well drained to poorly drained, medium textured soils; on flood plains and stream terraces

Areas of these soils are scattered throughout Union County on wide flood plains and stream terraces bordered by hilly uplands.

This map unit makes up about 10 percent of Union County. It is about 55 percent Patton soils, 20 percent Wilbur soils, 16 percent Wakeland soils, and 9 percent soils of minor extent.

The soils in this map unit are about the same elevation. The nearly level, poorly drained Patton soils are on stream terraces and are commonly covered by alluvial, brown silt loam 6 to 20 inches thick. Wilbur soils are nearly level and moderately well drained, and Wakeland soils are nearly level and somewhat poorly drained. All of these soils have a surface layer of silt loam. Patton soils have a subsoil and substratum of silty clay loam, and Wilbur and Wakeland soils have a substratum of silt loam.

Of minor extent are areas of well drained Haymond soils and poorly drained Karnak soils on flood plains, and areas of moderately well drained Uniontown soils and somewhat poorly drained Henshaw soils on stream terraces.

The soils in this map unit are used mainly for cultivated crops. Most of the acreage has been cleared and drained. Wetness and flooding are the main limitations for farming and most other uses. Flooding occurs mostly in the winter and in spring.

If adequately drained, this map unit is well suited to cultivated crops. Wetness and the hazard of flooding are severe limitations for homesites and for most urban and recreation uses. The soils have good potential for openland and woodland wildlife habitat.

5. Uniontown-Patton-Henshaw

Deep, nearly level to sloping, well drained to poorly drained, moderately fine textured soils; on stream terraces

This map unit is in the southwestern and northeastern parts of Union County. Most of the acreage is on wide, nearly level stream terraces. However, some of the gently sloping to sloping Uniontown soils are on side slopes of terraces.

This map unit (fig. 5) makes up about 15 percent of Union County. It is about 33 percent Uniontown soils, 21 percent Patton soils, 9 percent Henshaw soils, and 37 percent soils of minor extent.

The deep, nearly level, well drained to moderately well drained Uniontown soils are commonly slightly higher in elevation than Patton and Henshaw soils. In places, they are on side slopes adjacent to flood plains. The deep, somewhat poorly drained Patton soils are on wide, nearly level or slightly depressional areas. The deep, nearly level, somewhat poorly drained Henshaw soils are slightly higher in elevation than the adjacent Patton soils. All of these soils have a surface layer of silt loam and a subsoil of silty clay loam.

Of minor extent are areas of well drained Memphis soils on uplands, and areas of well drained Haymond soils, moderately well drained Wilbur soils, and somewhat poorly drained Wakeland soils on flood plains.

The soils in this map unit are used mostly for cultivated crops, but some areas are used for hay and pasture. A few small, narrow areas along streams remain in woods. Most of the acreage has been drained by ditches and tile. Wetness and flooding are the main limitations for farming and most other uses. Some areas are subject to ponding.

If adequately drained, this map unit is well suited to cultivated crops. Because wetness and the hazard of flooding are such severe limitations in most areas, these soils have poor suitability for homesites and for most urban uses. The soils are suitable for some recreation uses, and they have good potential as habitat for openland and woodland wildlife.

6. Memphis-Wellston

Deep, gently sloping to steep, well drained, moderately fine textured soils; on uplands

Areas of these soils are in the southern part of Union County on hilly uplands dissected by narrow valleys.

This map unit (fig. 6) makes up 13 percent of Union County. It is about 39 percent Memphis soils, 10 percent Wellston soils, and 51 percent soils of minor extent.

The deep, well drained Memphis soils are on long, winding ridgetops at the higher elevations in the area. These soils formed in loess. The deep, well drained Wellston soils are on sides of hills. They formed in shallow loess over residuum from sandstone, siltstone, and shale. Both of these soils have a surface layer of silt loam and a subsoil of silty clay loam. Severely eroded areas have a surface layer of silty clay loam.

Of minor extent are areas of moderately well drained Loring soils and well drained Frondorf and Steinsburg soils on uplands, and areas of moderately well drained Wilbur soils and somewhat poorly drained Wakeland soils on flood plains.

The soils in this map unit are used mostly for woodland and pasture. The larger areas of gently sloping and sloping soils on uplands are used for cultivated crops, mainly corn and soybeans. Many rural dwellings

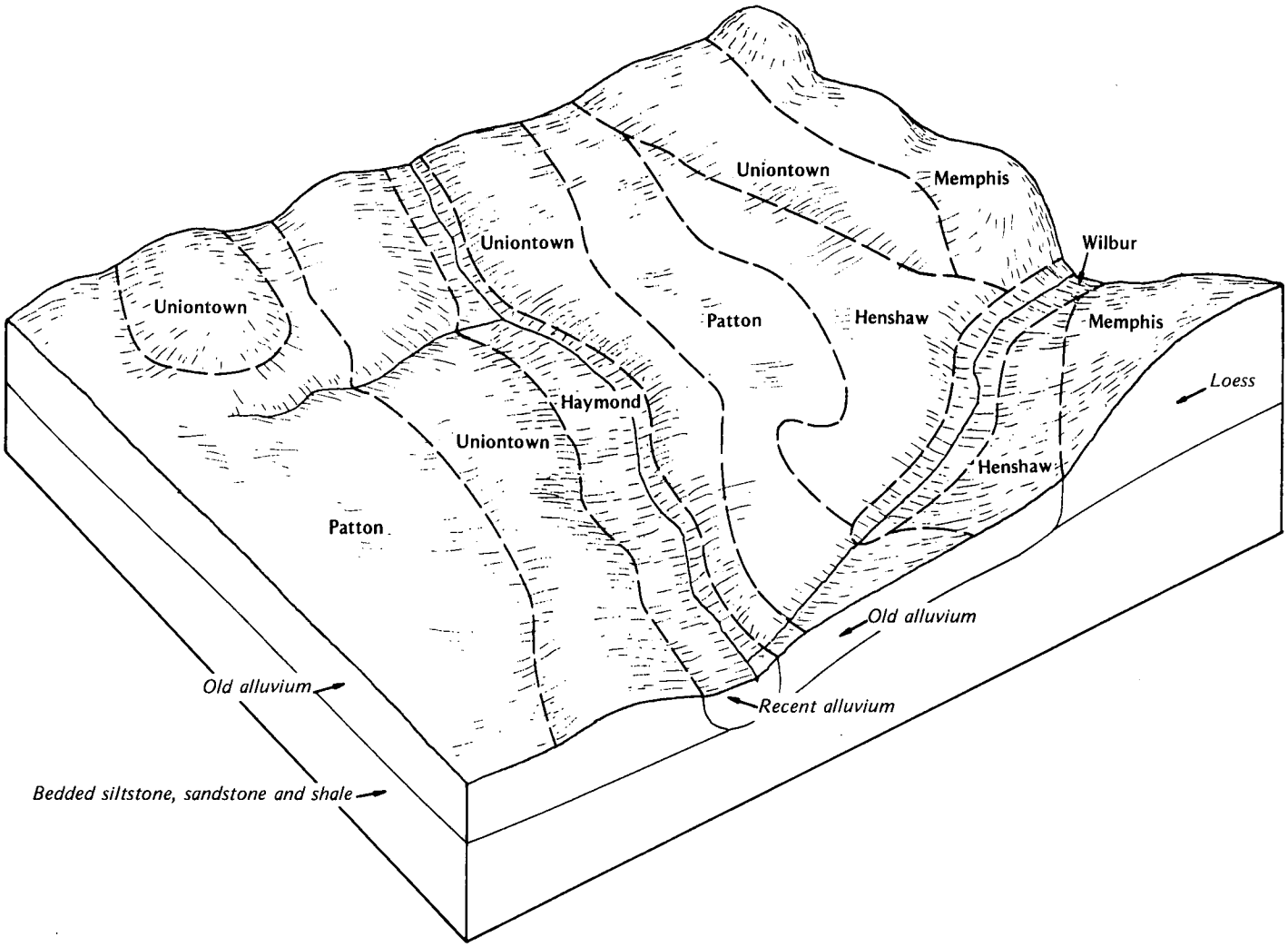


Figure 5.—Relationship of soils to topography and underlying material in the Uniontown-Patton-Henshaw map unit, in Union County.

are on the gently sloping soils on uplands. Steepness of slopes and the hazard of erosion are the main limitations for farming.

If erosion is controlled, this map unit is suited to cultivated crops. The gently sloping and sloping soils on uplands are well suited to homesites and to urban and recreation uses. The soils have good potential for the development of openland and woodland wildlife habitat.

7. McGary-Belknap

Deep, nearly level, somewhat poorly drained, medium textured and fine textured soils; on flood plains and stream terraces

This map unit (fig. 7) is in the southern part of Union County along the Tradewater River. The patter of soils is similar to that of the McGary-Belknap map unit in Webster County. However, it differs in the percentages of minor soils.

This map unit makes up about 2 percent of Union County. It is about 29 percent McGary soils, 11 percent Belknap soils, and 60 percent soils of minor extent.

In most places, McGary soils are on terraces that are slightly higher in elevation than the Belknap soils on flood plains. McGary soils generally have a surface layer of silt loam and a subsoil and substratum of silty clay or clay. Belknap soils have a surface layer of brown silt loam and a substratum that is mostly gray silt loam mottled with brown.

Of minor extent are areas of moderately well drained Wilbur soils and somewhat poorly drained Wakeland

soils on flood plains, and areas of well drained Markland soils, moderately well drained Otwell soils, and somewhat poorly drained Weinbach soils on stream terraces.

The soils in this map unit are used for cultivated crops, woods, and pasture. Most of the woodland is in areas of McGary soils. Wetness and the hazard of flooding are the main limitations for farming and for most other uses.

If adequately drained, this map unit is suited to cultivated crops. Wetness, shrink-swell potential, and the hazard of flooding are severe limitations for homesites and for most urban and recreation uses. The soils have good potential for the development of openland and woodland wildlife habitat.

8. Loring-Wellston-Zanesville

Deep, gently sloping to moderately steep, moderately well drained to well drained, moderately fine textured soils; on uplands

Areas of these soils are in the south-central part of Union County on hilly uplands dissected by narrow valleys (fig. 8). The pattern of soils is similar to that of the Loring-Wellston-Zanesville map unit in Webster County. However, it differs in percentages of minor soils.

This map unit makes up about 2 percent of Union County. It is about 31 percent Loring soils, 20 percent Wellston soils, 16 percent Zanesville soils, and 33 percent soils of minor extent.

The gently sloping to sloping, moderately well drained Loring soils are on long, winding, upland ridgetops. They formed in loess. A compact fragipan is between a depth of 24 and 35 inches. The well drained Wellston soils are on hillsides that have slopes of 12 to 20 percent. Many areas of Wellston soils are severely eroded. The moderately well drained to well drained Zanesville soils are on hillsides that have slopes of 6 to 12 percent. Wellston and Zanesville soils developed in shallow loess over residuum from sandstone, siltstone, or shale. These

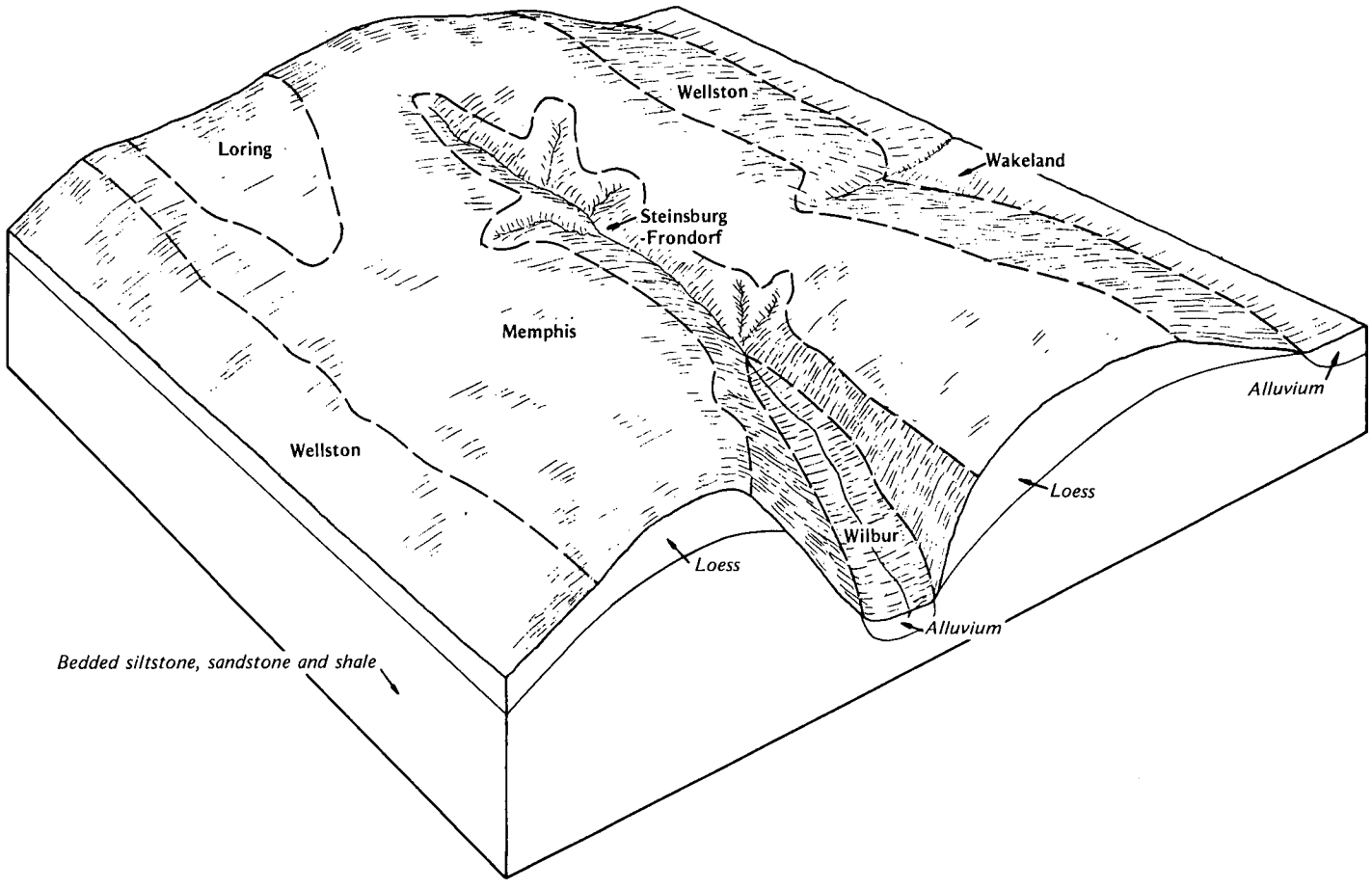


Figure 6.—Relationship of soils to topography and underlying material in the Memphis-Wellston map unit, in Union County.

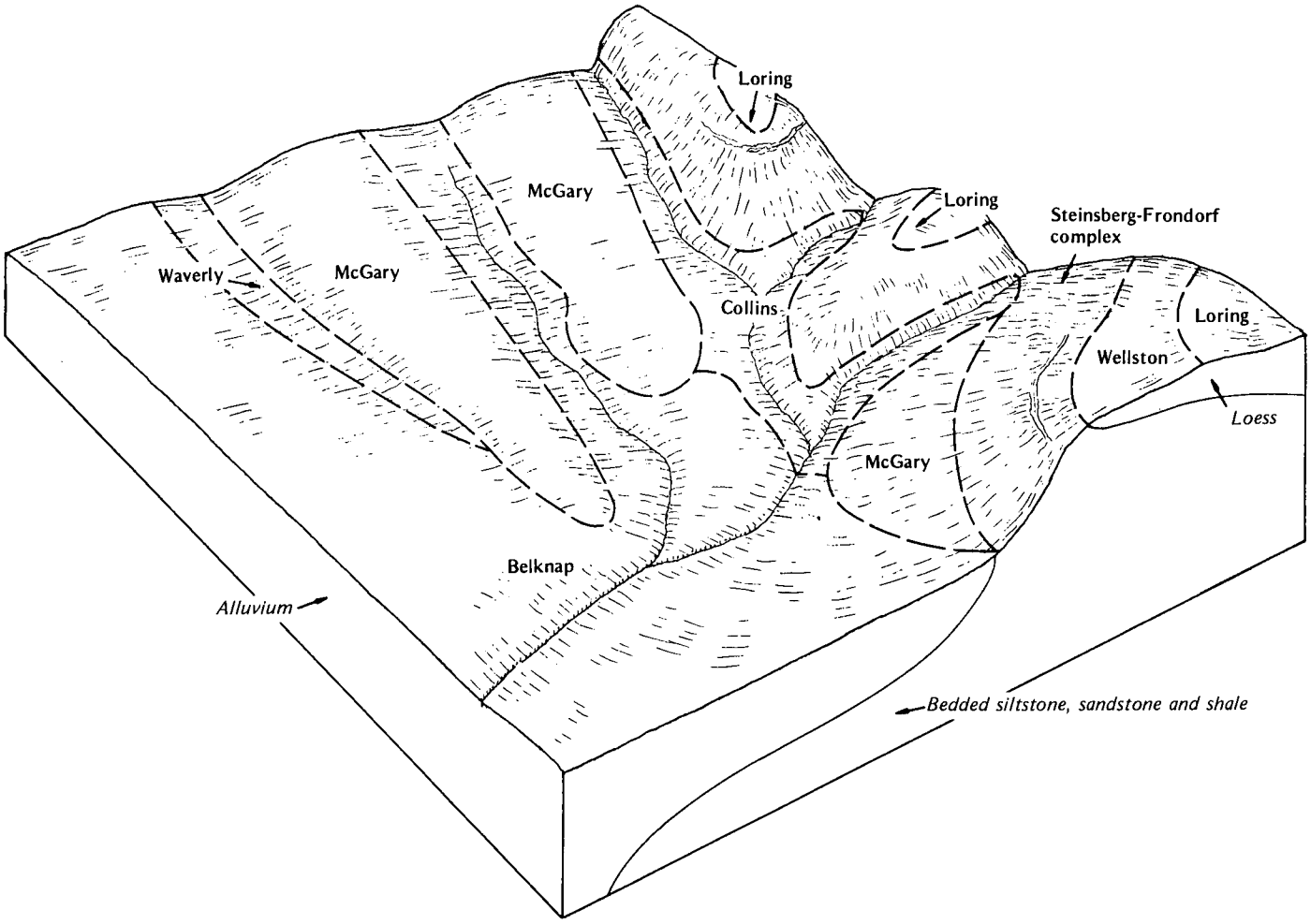


Figure 7.—Relationship of soils to topography and underlying material in the McGary-Belknap map unit, in Union County. Included in the diagram are soils in the adjacent Loring-Wellston and Steinsburg-Frondorf map units.

soils have a compact fragipan between a depth of 24 to 30 inches. All of these soils have a surface layer of silt loam and a subsoil of silty clay loam. Severely eroded areas, however, have a surface layer of silty clay loam.

Of minor extent are areas of well drained Frondorf soils on uplands, moderately well drained Uniontown soils and somewhat poorly drained Henshaw soils on stream terraces, and well drained Haymond soils on flood plains.

The soils in this map unit are used mainly for general farming. Corn, soybeans, and tobacco are the cultivated crops. Large areas of these soils are used for pasture of tall fescue, and a large acreage is used for hay. Some steep areas remain in woods, and other large areas are covered with sagegrass, bushes, and blackberry briars. Past erosion, risk of further erosion, and steepness of slopes are the main limitations for cultivation.

This map unit is suited to cultivated crops. It is suitable for homesites, for most urban uses, and for some recreation uses. Slow permeability in the fragipans of the Loring and Zanesville soils and steepness of slopes of the Wellston soils are the main limitations. These soils have good potential for the development of openland and woodland wildlife habitat.

general soil map units of Webster County

1. Uniontown-Patton-Henshaw

Deep, nearly level to sloping, well drained to poorly drained, moderately fine textured soils; on stream terraces

This map unit is in the north-central part of Webster County. The major soils are on wide, nearly level to gently sloping terraces. They are slightly higher in

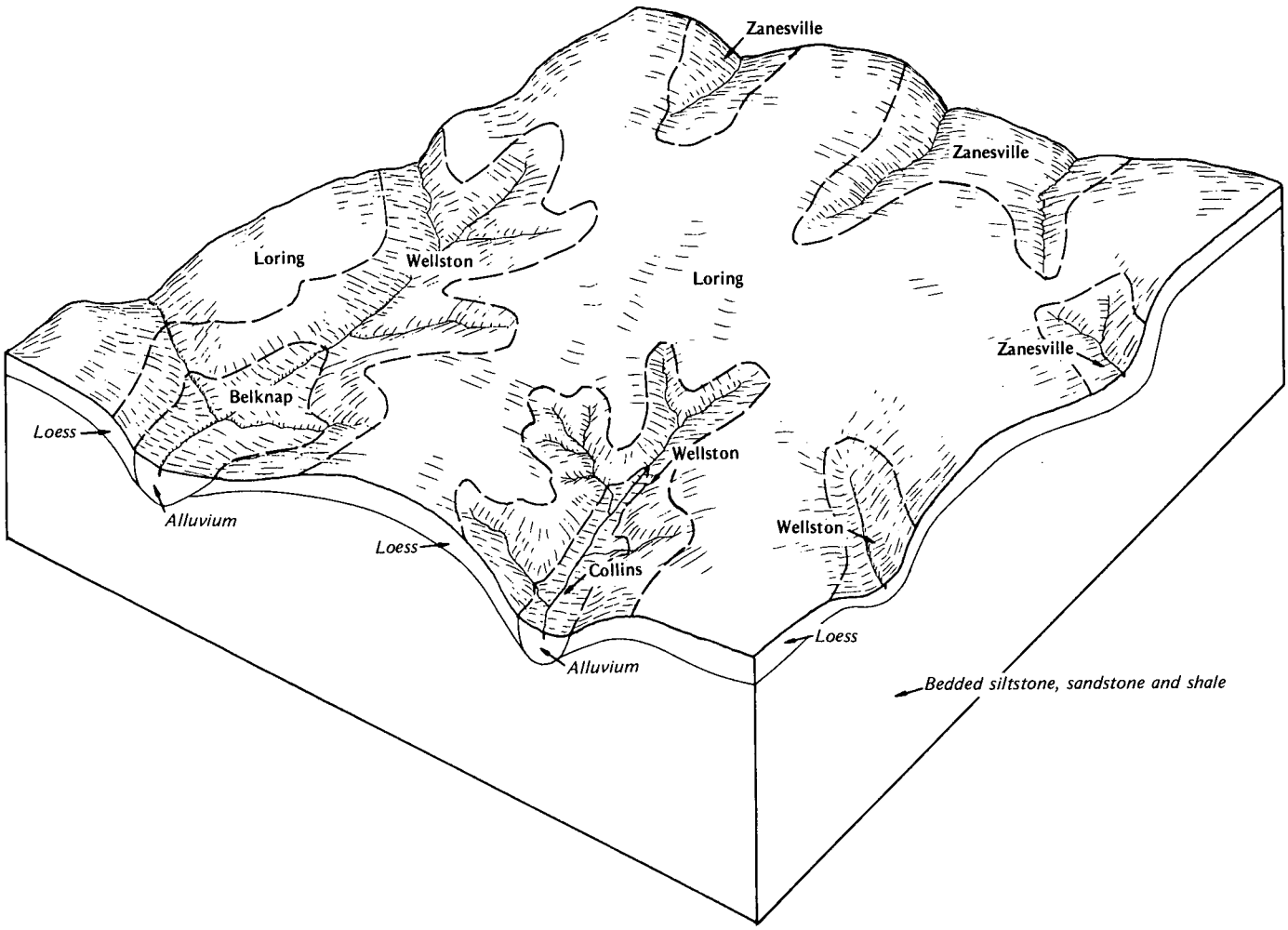


Figure 8.—Relationship of soils to topography and underlying material in the Loring-Wellston-Zanesville map unit, in Union County.

elevation than other nearby alluvial soils but are lower than adjacent upland soils. In places, the gently sloping and sloping soils are adjacent to streams. The pattern of soils is similar to that of the Uniontown-Patton-Henshaw map unit in Union County. However, it differs in the percentages of minor soils.

This map unit makes up about 1 percent of Webster County. It is about 19 percent Uniontown soils, 16 percent Patton soils, 10 percent Henshaw soils, and 55 percent soils of minor extent.

The deep, nearly level, well drained to moderately well drained Uniontown soils are commonly slightly higher in elevation than adjacent Patton and Henshaw soils, but in places they occur at lower elevations on side slopes adjacent to flood plains. The deep, poorly drained Patton soils are on wide, nearly level or slightly depressional areas. The deep, nearly level, somewhat poorly drained Henshaw soils are commonly slightly higher in elevation than adjacent Patton soils. All of these soils have a surface layer of silt loam and a subsoil of silty clay loam.

Of minor extent are areas of well drained Memphis soils and moderately well drained Loring and Grenada soils on uplands, and areas of somewhat poorly drained Belknap soils and poorly drained Waverly soils on flood plains.

The soils in this map unit are used mainly for cultivated crops, but some areas are used for hay and pasture. A few small narrow areas along steams remain in woods. Most of the acreage has been drained by ditches and tile. Wetness is the main limitation for farming and for most urban uses. Most areas are subject to ponding and flooding.

If adequately drained, this map unit is well suited to cultivated crops. Because wetness and the hazard of flooding are such severe limitations in most areas, these soils have poor suitability for homesites and for most urban uses. They are suitable for some recreation uses, and they have good potential as habitat for openland and woodland wildlife.

2. Loring-Grenada-Calloway

Deep, nearly level to sloping, moderately well drained to somewhat poorly drained, medium textured and moderately fine textured soils that have a fragipan; on uplands

Areas of these soils are scattered throughout Webster County. The typography is characterized by wide, nearly level to sloping hilltops and narrow, nearly level valleys. The soils formed in loess. The dominant soils are between the flood plains and the steep, hilly uplands.

This map unit (fig. 9) makes up about 32 percent of Webster County. It is about 19 percent Loring soils, 18 percent Grenada soils, 5 percent Calloway soils, and 58 percent soils of minor extent.

The deep, gently sloping to sloping, moderately well drained Loring soils are on hilltops and sides of hills. The deep, gently sloping, moderately well drained Grenada soils are commonly at an elevation between that of the Loring and Calloway soils. The deep, somewhat poorly drained Calloway soils are nearly level. All of these soils have a surface layer of silt loam in most areas. Severely eroded areas, however, have a surface layer of silty clay loam. The subsoil ranges from silt loam to silty clay loam. A fragipan between a depth of 20 to 35 inches is common in the dominant soils in this map unit.

Of minor extent are areas of well drained Wellston and Frondorf soils and moderately well drained to well drained Zanesville soils on uplands, and areas of moderately well drained Collins soils, somewhat poorly drained Belknap soils, and poorly drained Waverly soils on flood plains.

The soils in this map unit are used for general farming. Corn, soybeans, tobacco, hay, and pasture are the cultivated crops. Rural dwellings are built on soils in this area, and a few small areas are used for urban purposes. A seasonal high water table caused by the fragipan is the main limitation for farming and for most other uses.

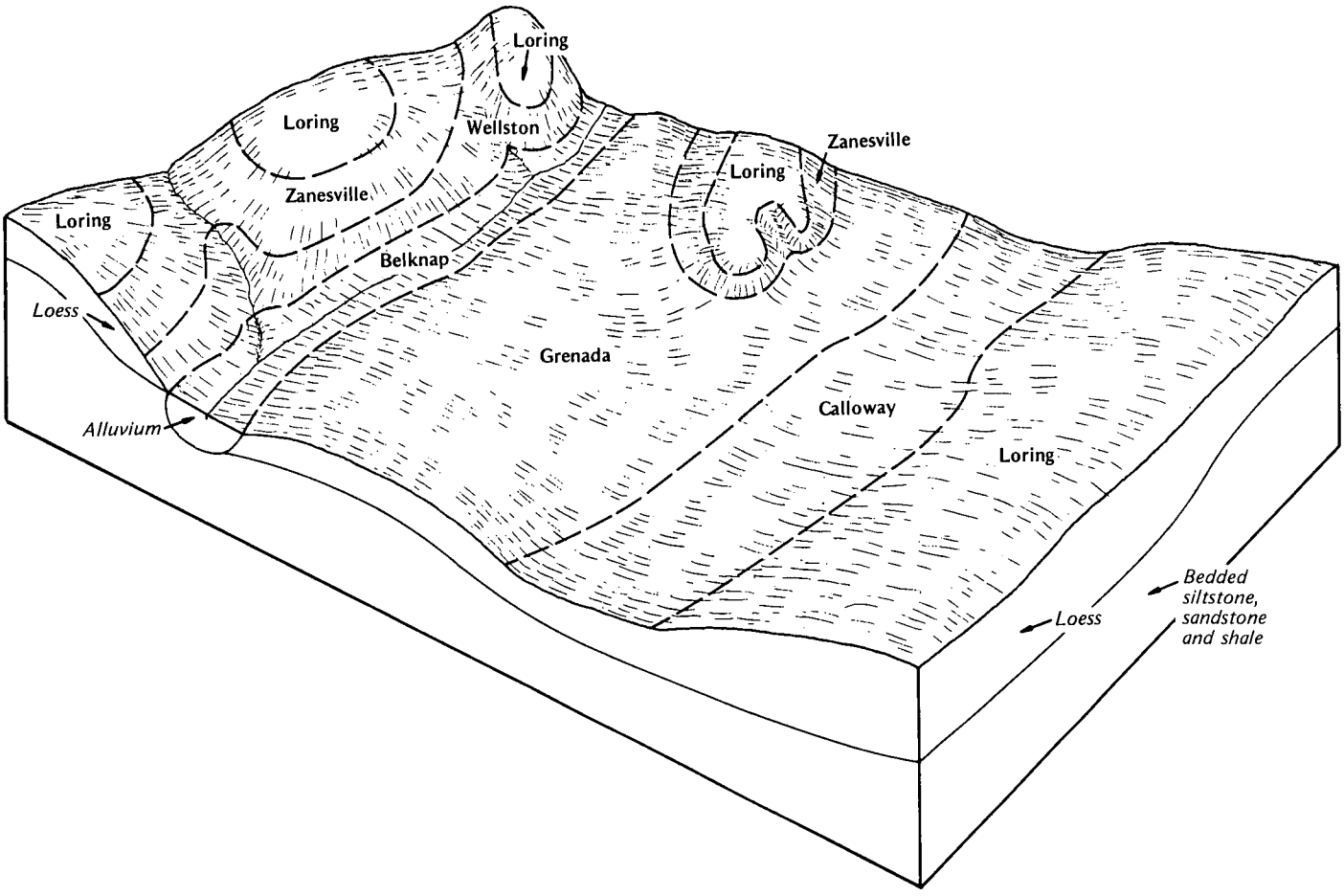


Figure 9.—Relationship of soils to topography and underlying material in the Loring-Grenada-Calloway map unit, in Webster County.

This map unit is well suited to cultivated crops if the moisture content is favorable. The dominant soils have a fragipan that limits moisture supply and depth of root penetration. These soils are suitable for homesites and for most urban and recreation uses. The slowly permeable fragipan in the subsoil is a severe limitation for septic tank absorption fields. In addition, wetness is a limitation. These soils have good potential as habitat for openland and woodland wildlife.

3. Belknap-Waverly

Deep, nearly level, somewhat poorly drained and poorly drained, medium textured soils; on flood plains

Areas of this map unit are scattered throughout Webster County on flood plains of small streams.

This map unit makes up about 13 percent of Webster County. It is about 59 percent Belknap soils, 11 percent Waverly soils, and 30 percent soils of minor extent.

The somewhat poorly drained Belknap soils are brown silt loam in the surface layer and upper part of the subsoil and dominantly gray silt loam below a depth of about 16 inches. The poorly drained Waverly soils are grayish brown silt loam mottled with gray in the surface layer and light gray and gray silt loam mottled with brown in the subsoil.

Of minor extent are areas of moderately well drained Collins soils on flood plains, and moderately well drained Grenada soils and somewhat poorly drained Calloway soils on uplands.

The soils in this map unit are used mainly for cultivated crops. Corn and soybeans are mostly grown, but some areas are used for pasture. Most of the acreage has been cleared and drained. A few areas remain in woods. Wetness is the main limitation for farming and most other uses. Flooding and ponding are hazards in winter and in spring.

If adequately drained, this map unit is well suited to cultivated crops. However, because wetness and flooding are such severe limitations and so difficult to overcome, these soils have poor suitability for homesites and for most urban and recreation uses. The soils have fair potential for the development of wetland wildlife habitat.

4. Karnak-McGary-Belknap

Deep, nearly level, somewhat poorly drained and poorly drained, medium textured and fine textured soils; on flood plains and stream terraces

Areas of these soils are in the eastern and western parts of Webster County. These soils, which formed in lacustrine deposits of slack-water clay and alluvium, are lower in elevation than nearby upland areas.

This map unit (fig. 10) makes up about 12 percent of Webster County. It is about 22 percent Karnak soils, 20 percent McGary soils, 18 percent Belknap soils, and 40 percent soils of minor extent.

In most places, the nearly level, poorly drained Karnak soils are at the lowest elevation. They have a surface layer of silty clay, except in those areas covered by recent alluvium. These areas have silt loam surface layers. The McGary and Belknap soils are slightly higher in elevation than Karnak soils. The nearly level, somewhat poorly drained McGary soils have a surface layer of silt loam and a subsoil of silty clay or clay. The nearly level, somewhat poorly drained Belknap soils have a surface layer and subsoil of silt loam. All of these soils have a seasonal high water table within 3 feet of the surface and are subject to flooding.

Of minor extent are areas of Markland, Otwell, and Weinbach soils on stream terraces, Collins and Waverly soils on flood plains, and Frondorf, Loring, and Grenada soils on uplands.

The soils in this map unit are used for cultivated crops, woods, and pasture. Most of the acreage of Karnak and Belknap soils has been cleared and drained. Most areas of the McGary soils remain in woods of post oak. A few fairly large areas of McGary soils are used for pasture of tall fescue. Wetness is the main limitation for farming. Ponding is common in winter and in spring. In addition, most areas are subject to flooding.

If adequately drained, this map unit is suited to cultivated crops. Karnak and Belknap soils respond well to drainage and other good management practices, but McGary soils are less responsive to a high level of management. The major soils in this map unit have poor suitability for homesites and for most urban and recreation uses because of wetness, the high shrink-swell potential, a seasonal high water table, and the hazard of being flooded. The soils have good potential as habitat for openland and woodland wildlife and fair potential as habitat for wetland wildlife.

5. Loring-Wellston-Zanesville

Deep, gently sloping to moderately steep, moderately well drained to well drained, moderately fine textured soils; on uplands

Areas of these soils are in central Webster County on hilly uplands dissected by narrow valleys.

This map unit makes up about 31 percent of Webster County. It is about 25 percent Loring soils, 22 percent Wellston soils, 17 percent Zanesville soils, and 36 percent soils of minor extent.

The gently sloping and sloping, moderately well drained Loring soils are on long and winding upland hilltops. They formed in loess. A compact fragipan is between a depth of 24 to 35 inches. The well drained Wellston soils are on hillsides that have slopes of 12 to 20 percent. Many areas of Wellston soils are severely eroded. The moderately well drained Zanesville soils are

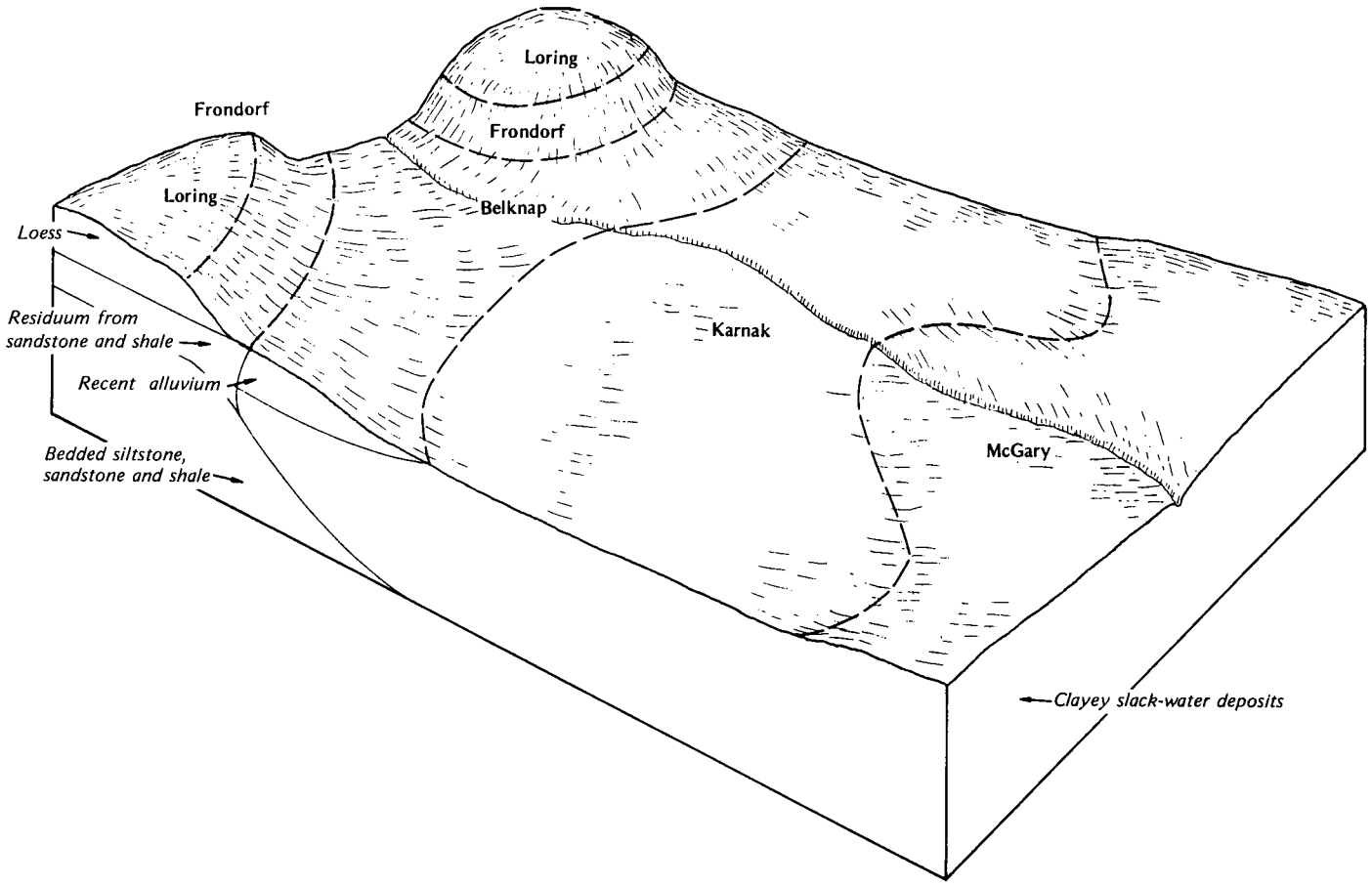


Figure 10.—Relationship of soils to topography and underlying material in the Karnak-McGary-Belknap map unit, in Webster County.

on hillsides that have slopes of 6 to 12 percent. Wellston and Zanesville soils developed in shallow loess over material weathered from sandstone, siltstone, or shale. They have a compact fragipan between a depth of 24 to 30 inches. All of these soils have a surface layer of silt loam and a subsoil of silty clay loam. Severely eroded areas, however, have a surface layer of silty clay loam.

Of minor extent are areas of well drained Memphis and Frondorf soils and moderately well drained Grenada soils on uplands, and areas of moderately well drained Collins soils and somewhat poorly drained Belknap soils on flood plains.

The soils in this map unit are used mainly for general farming. Corn, soybeans, and tobacco are the cultivated crops. Large areas are used for pasture of tall fescue and for hay. Some areas on steeper slopes remain in woods, and other large areas are covered with sagegrass, bushes, and blackberry briars. Past erosion and steepness of slopes are the main limitations.

This map unit is suited to cultivated crops. The soils are suitable for homesites, for most urban uses, and for most recreation uses. Wetness, slow permeability of the fragipan, and steepness of slopes are the main limitations. These soils have good potential for the development of openland and woodland wildlife.

6. McGary-Belknap

Deep, nearly level, somewhat poorly drained, medium textured and fine textured soils; on flood plains and stream terraces

This map unit is in the western part of Webster County along the Tradewater River.

This map unit makes up about 3 percent of Webster County. It is about 30 percent McGary soils, 22 percent Belknap soils, and 48 percent soils of minor extent.

In most places, the McGary soils on terraces are at a slightly higher elevation than the Belknap soils on flood plains. McGary soils generally have a surface layer of silt loam and a subsoil of silty clay or clay. Belknap soils

have a surface layer of brown silt loam and a subsoil of mostly gray silt loam mottled with brown.

Of minor extent are areas of moderately well drained Collins soils and poorly drained Waverly and Karnak soils on nearly level flood plains, and areas of moderately well drained Otwell soils on stream terraces.

The soils in this map unit are used for cultivated crops, woods, and pasture. Most of the wooded area is McGary soils. Wetness and the hazard of flooding are the main limitations for farming and for most other uses.

If adequately drained, this map unit is suited to cultivated crops. These soils have poor suitability for homesites and for most urban and recreation uses because of wetness, the high shrink-swell potential of the McGary soils, and the hazard of being flooded. The soils have good potential for the development of openland and woodland wildlife habitat.

7. Memphis-Wellston

Deep, gently sloping to steep, well drained, moderately fine textured soils; on uplands

Areas of these soils are in the western and northwestern parts of Webster County on hilly uplands dissected by narrow valleys. The pattern of soils is similar to that of the Memphis-Wellston unit in Union County (see fig. 6). However, it differs in percentages of minor soils.

This map unit makes up about 8 percent of Webster County. It is about 37 percent Memphis soils, 32 percent Wellston soils, and 31 percent soils of minor extent.

The deep, well drained Memphis soils are at higher elevations on long, winding ridgetops. They formed in loess. The deep, moderately steep, well drained Wellston soils are on the sides of hills. They formed in shallow loess over residuum from sandstone, siltstone, and shale. Both soils have a surface layer of silt loam and a subsoil of silty clay loam. Severely eroded areas, however, have a surface layer of silty clay loam.

Of minor extent are areas of moderately well drained Loring soils on uplands, and areas of well drained Frondorf and Steinburg soils and somewhat poorly drained Belknap soils on flood plains.

The soils in this map unit are used mostly for woodland and pasture. The larger areas of gently sloping and sloping Memphis and Wellston soils on uplands are used for cultivated crops. Corn and soybeans are the main crops. Many rural dwellings are on the gently sloping soils on uplands. Steepness of slopes and the hazard of erosion are the main limitations for farming.

If erosion is controlled, this map unit is suited to cultivated crops. The gently sloping and sloping Memphis and Wellston soils are suitable for homesites and for most urban and recreation uses. The soils have good potential for development of openland and woodland wildlife habitat.

broad land use considerations

Decisions about the land to be used for urban development are likely to become an important issue in the survey area. Each year a number of small tracts are converted to urban use. Most of this converted land is used for homesites or industrial sites near small towns and along major roads. An increasing number of persons who work in the coal mines and manufacturing plants are buying lots and small tracts for homesites. This trend is expected to increase.

The general soil maps are most helpful for general planning of urban areas; however, they cannot be used for the selection of sites for specific structures. Generally, the soils in the survey area that are well suited to cultivated crops are also well suited to urban development. Data about specific soils in this survey can be helpful in planning future land use patterns.

Some parts of the survey area are entirely unsuited to urban development. Flooding is a severe limitation on the Nolin-Huntington-Newark and Belknap-Waverly map units and on those areas of the Melvin-Wheeling, Memphis-Wilbur-Wakeland, Patton-Wilbur-Wakeland, McGary-Belknap, and Karnak-McGary-Belknap map units that are on flood plains. Steep soils that have hard bedrock a few feet below the surface are in many parts of the Memphis-Wellston and Loring-Wellston-Zanesville map units. Urban development is costly on such soils. The clayey soils of the Karnak-McGary-Belknap and McGary-Belknap map units have high shrink-swell potential that severely limits their use for urban development.

Large areas of the counties, however, can be developed at lower cost. Some areas of the Melvin-Wheeling and Memphis-Wilbur-Wakeland map units are not on flood plains, and some areas of the Memphis-Wellston map unit are less steep than others. The undulating to rolling portions of the Loring-Grenada-Calloway and Loring-Wellston-Zanesville map units are also suitable for urban uses. However, the dominant soils in those two units have slowly permeable fragipans which are limitations for septic tank absorption fields.

In some units, soils that are suited to farming are less suitable for nonfarm uses, for example, the Uniontown-Patton-Henshaw and Patton-Wilbur-Wakeland map units. In those units the Patton and Henshaw soils are suitable for nonfarm use if they are properly drained and protected from flooding in periods of unusual storms.

Most soils in the survey area are suited to woodland, but generally it is not economical to use the most productive farming soils for woodland. The largest acreage of woodland is in the steepest parts of the Memphis-Wellston and Loring-Wellston-Zanesville map units. There is also considerable woodland in the wetter parts of the Nolin-Huntington-Newark, Melvin-Wheeling, McGary-Belknap, Karnak-McGary-Belknap, and Belknap-Waverly map units. Commercially valuable trees do not grow rapidly on the McGary soils.

Most map units in the survey area have sufficient trees, grasses, or grain crops to provide adequate food and cover for wildlife. Undrained swamps in the Melvin-Wheeling map unit have good potential for development of wetland wildlife habitat.

Many hilly, upland areas have good suitability for extensive recreation and nature study use, for example, the Memphis-Wellston and Loring-Wellston-Zanesville map units. Hardwood forests enhance the beauty of these areas.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Memphis silt loam, 2 to 6 percent slopes, is one of several phases in the Memphis series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. The Markland-Collins complex is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Dumps, mine is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties (*18, 20*)of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

As—Ashton silt loam. This deep, well drained, nearly level soil is on stream terraces along the Ohio River. Slopes are uniform except for a few short breaks. They range from 0 to 2 percent. Areas are 10 to 60 acres.

Typically, the surface layer is very dark grayish brown silt loam 9 inches thick. The subsoil is brown silt loam and silty clay loam that extends to a depth of about 58 inches. The substratum is brown fine sandy loam to a depth of 64 inches.

This soil is high in natural fertility and moderate in content of organic matter. It is neutral to medium acid throughout. The permeability is moderate, and the available water capacity is high. The soil has good tilth and can be worked throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots. This soil is subject to occasional flooding.

Included with this soil in mapping are small areas of Otwell and Nolin soils. Also included are a few intermingled areas of Wheeling soils. The included soils make up about 20 percent of the map unit. Areas generally are less than I acre.

Most areas of this Ashton soil are used for farming. A few small areas remain in native hardwoods. The soil is well suited to row crops, small grain, hay, and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is not a hazard.

This soil is well suited to black walnut, northern red oak, sweetgum, cherrybark oak, eastern white pine, and yellow-poplar trees. Plant competition is a concern in management.

The hazard of flooding severely limits this soil for most urban uses.

This soil is in capability class I and woodland group 1o.

Bn—Belknap silt loam. This deep, somewhat poorly drained, nearly level soil is on flood plains along small

streams. Most areas are dissected by drainage ditches and small streams. Slopes are smooth and range from 0 to 2 percent. Areas range from 4 to 80 acres.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The substratum is brown silt loam mottled with gray and yellowish brown to a depth of 15 inches and gray or light gray silt loam mottled with pale brown and yellowish brown to a depth of 60 inches.

This soil is medium in natural fertility and low in content of organic matter. It is very strongly acid to strongly acid throughout unless the surface layer has been limed. The permeability is moderate to moderately slow, and the available water capacity is high. The soil has good tilth and can be cultivated throughout a wide range of moisture content. The root zone is somewhat restricted by the seasonal high water table at a depth of 2 to 3 feet, but it is deep and is easily penetrated by plant roots. This soil is subject to occasional flooding.

Included with this soil in mapping are areas of Collins soils and Waverly soils. Also included are areas of soils that have a higher content of clay than the Belknap soils. The included soils make up 5 to 15 percent of most areas and are generally less than 2 acres.

If drained, this Belknap soil is well suited to row crops (fig. 11) and small grain, and high yields can be obtained. The hazard of flooding (fig. 12) and a seasonal high water table are the main limitations. Erosion is not a hazard. Tile drainage is needed for high yields of crops commonly grown. Good tilth can be maintained by returning crop residue to the soil.

This soil is well suited to pin oak, sweetgum, red maple, eastern cottonwood, American sycamore, and baldcypress trees. Plant competition and limited use of equipment because of wetness are management concerns.

This soil is severely limited for most urban uses because of the hazard of flooding and a seasonal high water table.

This soil is in capability subclass IIw and woodland group 2w.

Ca—Calloway silt loam. This deep, somewhat poorly drained, nearly level soil is on broad upland divides and old stream terraces. Slopes are smooth and range from 0 to 2 percent. Areas are 5 to 50 acres.

Figure 11.—An area of Belknap silt loam used for corn and soybeans.

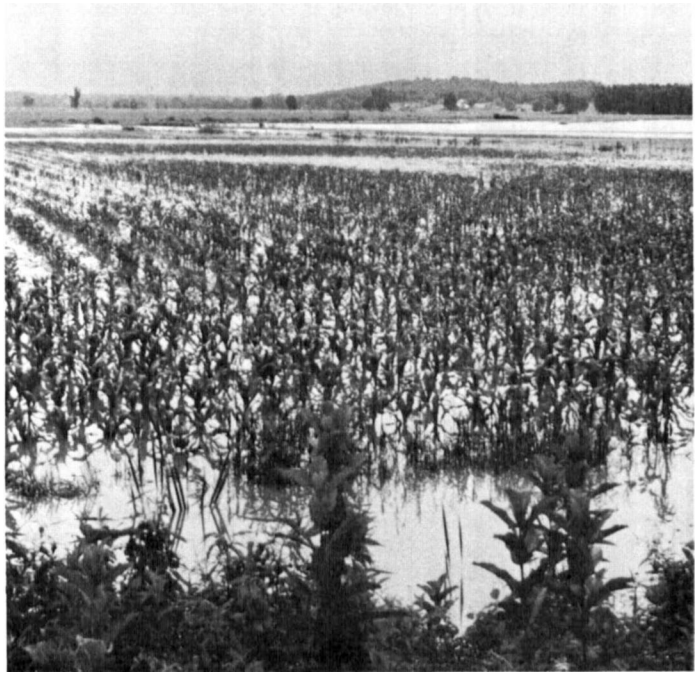


Figure 12.—An area of corn on Belknap and Waverly soils. These alluvial soils are sometimes flooded late in spring.

Typically, the surface layer is dark grayish brown silt loam 9 inches thick. The subsoil extends to a depth of 61 inches. It is yellowish brown to light brownish gray silt loam that has light gray mottles to a depth of 21 inches. The lower part of the subsoil is a firm and compact, yellowish brown silty clay loam fragipan that has gray mottles.

This soil is low in natural fertility and content of organic matter. It is very strongly acid or strongly acid throughout except for surfaces that have been limed. The permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate. The root zone is moderately deep. The soil is easy to till if moisture content is favorable. The seasonal high water table is at a depth of 1 foot to 2 feet.

Included with this soil in mapping are areas of Grenada and Belknap soils that have texture and slopes similar to the Calloway soil. The included soils make up less than 5 percent of this map unit. Areas are less than 1 acre.

This Calloway soil is wet for long periods during winter and early in spring. The vertical movement of roots, air, and water is restricted by the fragipan.

Most areas of this soil are used for farming, but a few small areas remain in woods. The soil is suited to row crops and pasture. However, wetness in winter and spring and dryness late in summer and early in fall are limitations. Erosion is a slight hazard if cultivated crops are grown. The soil is not suited to deep rooted crops, but it is suited to soybeans and to pasture and hay plants that withstand wetness. Surface drains are commonly used to remove excess water. Removing water from this soil with tile drainage is limited in effectiveness.

This soil is well suited to sweetgum, Shumard oak, yellow-poplar, and cherrybark oak trees. Limitations to the use of equipment because of wetness and plant competition are concerns in management.

This soil has poor suitability for most urban uses because of the wetness and slow permeability. Because the fragipan in the subsoil is slowly permeable, this soil is severely limited for septic tank absorption fields. Some areas near streams are subject to flooding.

This soil is in capability subclass IIIw and woodland group 1w.

Co—Collins silt loam. This deep, moderately well drained, nearly level soil is in valleys along small streams. Slopes are smooth and range from 0 to 2 percent. Small streams and drainage ditches are common. Areas are 4 to 50 acres.

Typically, the surface layer is brown silt loam 9 inches thick. The substratum extends to a depth of 60 inches. It is brown silt loam to a depth of 15 inches, brown to pale brown silt loam mottled in shades of brown and gray to a depth of 48 inches, and light gray silt loam mottled in shades of gray and brown to a depth of 60 inches.

This soil is medium in natural fertility and moderate in content of organic matter. It is very strongly acid or strongly acid throughout unless the surface layer has been limed. The permeability is moderate, and the available water capacity is high. This soil has good tilth and can be cultivated throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots. This soil is subject to occasional flooding. The seasonal high water table is at a depth of 2 to 5 feet.

Included with this soil in mapping are areas of Belknap soils. Also included are areas of soils that have a higher clay content than the Collins soil. The included soils make up about 5 to 15 percent of this map unit. Areas generally are less than 2 acres.

Most areas of this Collins soil are used for farming. The soil is well suited to row crops, but it is less well suited to those crops that carry through the winter, for example, small grain, hay, and pasture plants. Flooding and wetness occur during the winter months. Most of the flooding is in winter or spring. Erosion is not a problem. Good tilth can be maintained by returning crop residue to the soil. The crops generally grown do not need tile drainage.

This soil is well suited to cherrybark oak, sweetgum, green ash, eastern cottonwood, and yellow-poplar trees.

Limitations to the use of equipment because of wetness and plant competition are management concerns.

The hazard of flooding severely limits this soil for most urban uses.

This soil is in capability class I and woodland group 1o.

Du—Dumps, mine. This waste material is from coal mines. It is mostly coal dust and black, slatelike fragments. This material is brought out of the mines with the coal and separated from the coal at the tipple. In some areas, it is stacked in large, solid piles. In other areas, it is pumped into ponds as slurry. Slopes range from 0 to 15 percent.

This material is extremely acid and is generally devoid of vegetation.

Dumps, mine, is not assigned to a capability class or woodland group.

FdE—Frondorf silt loam, 20 to 30 percent slopes. This moderately deep, well drained, steep soil is on hillsides of the uplands. Areas of this soil are frequently dissected by intermittent drainageways. Slopes are irregular and convex. Areas are 9 to 40 acres.

Typically, the surface layer is very dark grayish brown silt loam 3 inches thick. The subsurface layer is grayish brown silt loam 3 inches thick. The subsoil extends to a depth of 25 inches. It is light yellowish brown silt loam to a depth of 14 inches and strong brown silty clay loam between a depth of 14 and 25 inches. The substratum between a depth of 25 and 28 inches is yellowish brown channery silty clay loam. Sandstone bedrock is at a depth of 28 inches.

This soil is medium in natural fertility and low in content of organic matter. It is strongly acid or very strongly acid throughout unless it has been limed. The permeability and available water capacity are moderate. The soil has good tilth and a moderately deep root zone. The hazard of erosion is very severe if vegetative cover is removed.

Included with this soil in mapping are areas of Wellston and Steinsburg soils. Also included are areas of a soil that has a more clayey subsoil than the Frondorf soil. The included soils, which are generally in long, narrow areas of less than 2 acres, make up 10 to 20 percent of this map unit.

Most areas of this Frondorf soil are used for trees. A few small areas are in pasture. The soil has good potential as habitat for woodland wildlife. The steepness of slope is a limitation for recreation uses.

This soil is poorly suited to row crops and small grain because of the steepness of slope. It is suitable for hay and pasture if good management practices are used.

This soil is suited to trees. The map unit has both north and south aspects. The south slopes are suitable for shortleaf pine, loblolly pine, and Virginia pine. The north slopes are suitable for yellow-poplar, black walnut, eastern white pine, shortleaf pine, and loblolly pine trees. The hazard of erosion, limited use of equipment, seedling mortality, and plant competition are management concerns.

This soil has poor suitability for urban uses because of the steepness of slopes.

This soil is in capability subclass VIe. It is in woodland group 2r, north aspect, and 3r, south aspect.

GnB—Grenada silt loam, 2 to 6 percent slopes. This deep, moderately well drained, gently sloping soil is on broad uplands. Slopes are smooth and have shallow drainageways. Areas range from 4 to 80 acres.

Typically, the surface layer is brown silt loam 6 inches thick. The subsoil extends to a depth of 48 inches. It is yellowish brown silt loam to a depth of 22 inches and light gray silt loam that has yellowish brown mottles between a depth of 22 and 24 inches. Between a depth of 24 and 48 inches, the subsoil is dark yellowish brown, firm, compact, brittle silt loam mottled in shades of gray, yellow, and brown. The substratum to a depth of 60 inches is dark yellowish brown, firm, compact, brittle silt loam that is mottled with gray.

This soil is medium in natural fertility and low in content of organic matter. It is strongly acid to very strongly acid throughout unless the surface layer has been limed. The permeability is moderate above the fragipan and slow in the fragipan. The root zone is moderately deep. The available water capacity is moderate. The seasonal high water table is at a depth of 1.5 to 2.5 feet. This soil is easy to till if moisture content is favorable. It is wet for long periods late in winter and early in spring. The vertical movement of roots, air, and water is restricted by the fragipan.

Included with this soil in mapping are areas of Calloway, Loring, and Belknap soils that are similar in texture and slope to the Grenada soil. These included soils make up 5 to 15 percent of the map unit. The areas are less than 2 acres.

Most areas of this Grenada soil are used for farming. The soil is suited to row crops, such as corn, soybeans, and tobacco, and to pasture and hay. It is not suited to deep rooted crops. Limitations are wetness late in winter and early in spring and, in some years, dryness late in summer and early in fall. If cultivated crops are grown, erosion is a moderate hazard and erosion control measures are needed.

This soil is suited to Shumard oak, cherrybark oak, white oak, sweetgum, shortleaf pine, and loblolly pine trees. Plant competition is the main concern in management.

This soil is suitable for most urban uses. Because the fragipan is slowly permeable, septic tank absorption fields are severely limited. A few low-lying, included areas are subject to rare flooding.

This soil is in capability subclass IIe and woodland group 3o.

Ha—Haymond silt loam. This deep, well drained, nearly level soil is on flood plains of small streams in

Union County. Slopes range from 0 to 2 percent. Areas range from 3 to 150 acres.

Typically, the surface layer is dark brown silt loam 9 inches thick. The underlying material to a depth of 60 inches is dark brown and brown silt loam.

This soil is medium in natural fertility and low in content of organic matter. The permeability is moderate, and the available water capacity is high. Reaction ranges from slightly acid to neutral throughout. The soil has good tilth and can be worked throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots. This soil is subject to occasional flooding.

Included with this soil in mapping are areas of Wilbur and Wakeland soils. Also included are soils that have darker layers below the surface than the Haymond soil. The included soils make up 5 to 10 percent of this map unit. The areas are generally less than 2 acres.

Most areas of this Haymond soil are used for corn and soybeans. A few small areas are used for pasture or hay.

This soil is well suited to row crops. Yields of small grain may be reduced by flooding in some years. Good tilth is easily maintained by returning crop residue to the soil.

This soil is well suited to yellow-poplar, eastern white pine, white oak, and black walnut trees. Plant competition is the main concern in use and management.

Mostly because of the hazard of flooding, this soil has poor suitability for most urban uses.

This soil is in capability class I and woodland group 1o.

He—Henshaw silt loam. This deep, somewhat poorly drained, nearly level soil is on stream terraces along tributaries to the Ohio and Tradewater Rivers. Slopes are smooth and range from 0 to 2 percent. Areas are 4 to 35 acres.

Typically, the surface layer is brown silt loam about 12 inches thick. The subsoil extends to a depth of 44 inches. It is pale brown silt loam that has gray mottles to a depth of 17 inches and yellowish brown to olive brown silty clay loam that has gray mottles to a depth of 44 inches. The substratum between a depth of 44 and 60 inches is light brownish gray silty clay loam that has yellowish brown mottles.

This soil is medium in natural fertility and low in content of organic matter. Unless limed, the surface layer and subsoil range from strongly acid through slightly acid. The permeability is moderately slow, and the available water capacity is high. The soil has good tilth and can be worked throughout a wide range of moisture content. Roots can easily penetrate deep into this soil. Most areas of this soil are subject to rare flooding if floodwaters are unusually high. Some low-lying, included areas are flooded more often. The seasonal high water table is at a depth of 1 foot to 2 feet.

Included with this soil in mapping are areas of Uniontown and Wakeland soils which are similar in texture and color to the Henshaw soil. Also included are spots of Patton soils that have a darker surface layer. The included soils make up about 20 percent of the map unit. Areas generally are less than 1 acre.

Most areas of this Henshaw soil are used for farming. The soil is suited to row crops, small grain, and hay, and high yields can be obtained. It is limited mainly by slow runoff and a seasonal high water table. Most crops respond favorably to improved drainage. Good tilth is easily maintained by returning crop residue to the soil. Erosion is not a hazard.

This soil is well suited to pin oak, sweetgum, white ash, yellow-poplar, and eastern cottonwood trees. Because of wetness, equipment limitations and plant competition are the main concerns in management.

This soil has poor suitability for most urban uses. The seasonal wetness, moderately slow permeability, and the hazard of flooding are severe limitations for buildings and septic tank absorption fields.

This soil is capability subclass IIw and woodland group 1w.

Hs—Huntington silt loam. This deep, well drained, nearly level soil is on flood plains of the Ohio (fig. 13) and Green Rivers. Areas are frequently dissected by ditches and small streams. Slopes are uniform and are 0 to 2 percent. Areas range from 5 to 350 acres.

Typically, the surface layer is very dark grayish brown silt loam 9 inches thick. The subsoil extends to a depth of 42 inches. It is very dark grayish brown silt loam to a depth of 15 inches and brown silt loam to a depth of 42 inches. The substratum is brown silt loam between a depth of 42 and 60 inches.

This soil is high in natural fertility and content of organic matter. It is slightly acid to mildly alkaline throughout. The permeability is moderate, and the available water capacity is high. This soil has good tilth and a deep root zone. It is subject to occasional flooding. Some low-lying, included areas are flooded for longer periods than the adjacent soils. The seasonal high water table is at a depth of 3 to 6 feet.

Included with this soil in mapping are areas of Nolin silty clay loam. Also included are areas of Robinsonville soils that are sandy throughout. The included soils make up 10 to 15 percent of the map unit. Areas generally are less than 2 acres.

Most areas of this Huntington soil are used for corn and soybeans. The soil is well suited to row crops, but it is not so well suited to small grain, hay, and pasture because of the hazard of flooding. Good tilth is easily maintained by returning crop residue to the soil.

This soil is well suited to black walnut, yellow-poplar, white ash, eastern white pine, and northern red oak trees. Plant competition is the main concern in management.

Figure 13.—An area of Huntington silt loam on the Ohio River flood plain. This soil is used mainly for corn and soybeans and is well suited to these crops.

This soil has poor suitability for most urban uses because of the hazard of flooding.

This soil is in capability class I and woodland group 1o.

Hu—Huntington-Robinsonville complex. These small areas of deep, well drained Huntington and Robinsonville soils are so intermingled that they could not be separated at the scale selected for mapping. Slopes range from 0 to 2 percent. Areas are 10 to 60 acres.

Huntington silt loam makes up about 46 percent of this map unit. Typically, the surface layer is very dark grayish brown silt loam 9 inches thick. The subsoil extends to a depth of 42 inches. It is very dark grayish brown silt loam between a depth of 9 and 15 inches and brown silt loam between a depth of 15 and 42 inches. The substratum between a depth of 42 and 60 inches is dark brown silt loam.

The Huntington soil is high in natural fertility and high in content of organic matter. It is slightly acid to mildly alkaline throughout. The permeability is moderate, and the available water capacity is high. The root zone is deep. This soil has good tilth. The seasonal high water table is at a depth of 3 to 6 feet. This soil is subject to occasional flooding.

Robinsonville fine sandy loam makes up about 32 percent of this map unit. Typically, the surface layer is dark grayish brown fine sandy loam 10 inches thick. The substratum is dark grayish brown loam between a depth of 10 and 32 inches, brown fine sandy loam between a depth of 32 and 45 inches, and dark grayish brown fine sandy loam between a depth of 45 and 60 inches.

The Robinsonville soil is medium in natural fertility and low in content of organic matter. It is slightly acid to moderately alkaline throughout. The permeability is moderate to moderately rapid, and the available water capacity is high. The soil has good tilth and can be cultivated throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots. This soil is subject to occasional flooding. The seasonal high water table is at a depth of 4 to 6 feet.

Included with this complex in mapping are small areas of Nolin silty clay loam. Some areas of this map unit have short slopes ranging to 20 percent.

This Huntington-Robinson complex is well suited to row crops. It is not so well suited to small grain, hay, and pasture because of the hazard of flooding. Good tilth is easily maintained by returning crop residue to the soil.

The soils in this complex are well suited to black walnut, American sycamore, yellow-poplar, white ash, sweetgum, and eastern cottonwood trees. Plant competition is the main concern of management.

This complex has poor suitability for urban uses because of the hazard of flooding.

This complex is in capability class I and woodland group 1o.

Ka—Karnak silt loam, overwash. This deep, poorly drained, nearly level soil is on flood plains. It developed in clayey slack-water deposits but has been covered with loamy alluvium 6 to 20 inches thick. Sloughs, ditches, and small streams dissect some areas. Slopes are smooth and range from 0 to 2 percent. Areas range from 15 to 400 acres.

Typically, the surface layer is brown silt loam 11 inches thick. The subsoil extends to a depth of 50 inches. It is dark grayish brown silty clay to a depth of 24 inches and gray silty clay mottled with yellowish brown to a depth of 50 inches. The substratum between a depth of 50 and 60 inches is gray silty clay that has yellowish brown mottles.

This soil is medium in natural fertility and low in content of organic matter. It is medium acid to mildly alkaline. The permeability is very slow to slow, and the available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture content. The depth of the root zone is determined by the seasonal high water table, which is 0 to 3 feet from the surface. This soil is subject to flooding if floodwaters are unusually high. The shrink-swell potential is high.

Included with this soil in mapping are areas of McGary and Belknap soils. Also included are areas of Karnak soils that have a silty clay loam or silty clay surface layer. The included soils make up 5 to 10 percent of the map unit. Areas are generally less than 2 acres.

Most areas of this Karnak soil are used for farming. The soil is suited to row crops, and high yields can be obtained. The potential, however, is limited by the hazard of flooding and a seasonal high water table. The soil is poorly suited to small grain. Good tilth is easily maintained by returning crop residue to the soil. Erosion is not a hazard. Artificial drainage permits earlier planting and later harvesting of row crops.

This soil is well suited to sweetgum, pecan, eastern cottonwood, green ash, baldcypress, pin oak, and swamp white oak trees. Equipment limitations, seedling mortality, and plant competition are the concerns in management.

This soil has poor suitability for urban uses. Flooding, the high shrink-swell potential, and wetness are severe limitations for buildings and septic tank absorption fields.

This soil is in capability subclass IIIw and woodland group 1w.

Kc—Karnak silty clay. This deep, poorly drained, nearly level soil is on flood plains. It formed in clayey, slack-water deposits. Sloughs, ditches, and small streams dissect some areas. Slopes are smooth and range from 0 to 2 percent. Areas range from 16 to 990 acres.

Typically, the surface layer is dark grayish brown silty clay 9 inches thick. The subsoil extends to a depth of 40 inches. It is dark grayish brown silty clay to a depth of 13 inches, dark gray silty clay to a depth of 25 inches, and gray silty clay to a depth of 40 inches. Mottles are dark yellowish brown and yellowish brown. The substratum to a depth of 60 inches is gray silty clay mottled with yellowish brown.

This soil is medium in natural fertility and low in content of organic matter. It is medium acid to mildly alkaline. The permeability is very slow to slow, and the available water capacity is high. This soil has poor tilth. It is plastic and sticky if wet. Cultivation when the soil is too wet causes crusting and clodding. The depth of the root zone varies with the seasonal high water table, which is 0 to 3 feet from the surface. This soil is subject to rare flooding. The shrink-swell potential is high.

Included with this soil in mapping are areas of McGary and Belknap soils that have a silt loam surface layer. The included soils make up less than 5 percent of the map unit. Areas are generally less than 2 acres.

Most areas of this Karnak soil are used for farming. The soil is suited to row crops, and high yields can be obtained. It is limited by wetness, a seasonal high water table, and the clayey surface layer. The soil is poorly suited to small grain, but it is suited to hay and pasture. The poor tilth can be improved by returning crop residue to the soil. Artificial drainage permits earlier planting and later harvesting of row crops.

This soil is well suited to sweetgum, pecan, eastern cottonwood, green ash, baldcypress, pin oak, and swamp white oak trees. Equipment limitations, seedling mortality, and plant competition are the concerns in management.

This soil has poor suitability for urban uses. Flooding, the high shrink-swell potential, and wetness are severe limitations for buildings and septic tank absorption fields.

This soil is in capability subclass IIIw and woodland group 1w.

Ld—Lindside silty clay loam. This deep, moderately well drained, nearly level soil is on flood plains. It formed in mixed alluvium. Most areas are along the Ohio River. Some areas are dissected by ditches and small streams. Slopes are smooth and range from 0 to 2 percent. Areas are 4 to 80 acres.

Typically, the surface layer is dark grayish brown silty clay loam 10 inches thick. The subsoil extends to a depth of 46 inches. It is brown silty clay loam to a depth of 29 inches and brown silty clay loam that has gray mottles to a depth of 46 inches. The substratum to a depth of 60 inches is brown silty clay loam that has gray mottles.

This soil is high in natural fertility and low in content of organic matter. It is medium acid to slightly acid except for surfaces that have been limed. The permeability is moderate to moderately slow, and the available water capacity is high. The soil has good tilth and can be worked throughout a wide range of moisture content. The seasonal high water table is at a depth of 1.5 to 3 feet. The root zone is deep and is easily penetrated by plant roots. This soil is subject to occasional flooding.

Included with this soil in mapping are areas of soils that have a fine sandy loam or silt loam surface layer. Also included are areas of Huntington and Nolin soils. The included soils make up less than 5 percent of the map unit. Areas are generally less than 6 acres.

Most areas of this Lindside soil are used for corn and soybeans. A few small areas remain in trees. The soil is well suited to row crops. Because of the hazard of flooding, it is not so well suited to small grain and hay and pasture crops that carry over the winter. Good tilth is easily maintained by returning crop residue to the soil.

This soil is well suited to northern red oak, yellow-poplar, eastern white pine, and black walnut trees. Plant competition is the main concern in management of woodland.

This soil has poor suitability for most urban uses because of the hazard of flooding and wetness.

This soil is in capability class I and woodland group 1o.

LoB—Loring silt loam, 2 to 6 percent slopes. This deep, moderately well drained, gently sloping soil is on uplands. It has a fragipan. Shallow drains and small streams dissect some areas. Slopes are smooth and convex. Areas range from 4 to 120 acres.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil extends to a depth of 50 inches. It is brown silty clay loam or silt loam to a depth of 31 inches, and a fragipan of firm, compact, brittle, brown silt loam that has mottles in shades of brown and gray between a depth of 31 and 50 inches. The substratum to a depth of 60 inches is dark yellowish brown silt loam that has gray mottles.

This soil is medium in natural fertility and low in content of organic matter. It is very strongly acid or strongly acid throughout unless the surface layer has been limed. The permeability is moderate above the fragipan and moderately slow in the fragipan. The available water capacity is moderate. This soil has good tilth and can be worked throughout a wide range of moisture content. Roots and water readily penetrate this soil to the fragipan, but further penetration is restricted. The seasonal high water table is at a depth of 2 to 3 feet.

Included with this soil in mapping are areas of Grenada, Zanesville, Wellston, and Memphis soils. The included soils make up 5 to 10 percent of this map unit. Areas are generally less than 3 acres.

Most areas of this Loring soil are used for farming (fig. 14). A few areas are idle or remain in native trees. This soil is well suited to row crops (fig. 15), small grain, hay, and pasture, and high yields can be obtained. Use of some soils is limited because of size and shape of the areas. The hazard of erosion is moderate. Measures to prevent erosion are needed if this soil is used for row crops. Good tilth is easily maintained by returning crop residue to the soil. Minimum tillage and the use of cover crops help to control erosion.

This soil is suited to cherrybark oak, yellow-poplar, southern red oak, sweetgum, and loblolly pine trees. Plant competition is the main concern in management of woodland.

This soil is suitable for most urban uses. However, the moderately slow permeability of the fragipan in the subsoil is a limitation for septic tank absorption fields.

This soil is in capability subclass IIe and woodland group 3o.

LoC—Loring silt loam, 6 to 12 percent slopes. This deep, moderately well drained, sloping soil is on upland ridgetops and hillsides. It has a fragipan. Slopes are dissected by drainageways. Areas are 3 to 90 acres.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil extends to a depth of 50 inches. It is brown silty clay loam to a depth of 31 inches and a fragipan of firm, compact, brittle, brown silt loam that has mottles in shades of brown and gray between a depth of 31 and 50 inches. The substratum to a depth of 60 inches or more is dark yellowish brown silt loam that has gray mottles.

This soil is medium in natural fertility and low in content of organic matter. It is very strongly acid or strongly acid throughout unless the surface layer has been limed. The permeability is moderate above the fragipan and moderately slow in the fragipan. The available water capacity is moderate. The soil has good tilth and can be worked throughout a wide range of moisture content. Roots and water readily penetrate this soil to the fragipan, but further penetration is restricted. The seasonal high water table is at a depth of 2 to 3 feet.

Included with this soil in mapping are areas of Grenada, Zanesville, Wellston, and Memphis soils. The included soils make up 5 to 10 percent of this map unit. Areas are generally less than 3 acres.

Most areas of this Loring soil are used for farming. A few areas are idle or remain in native trees. This soil is suited to row crops and small grain, and high yields can be obtained. The use of most areas is limited because of

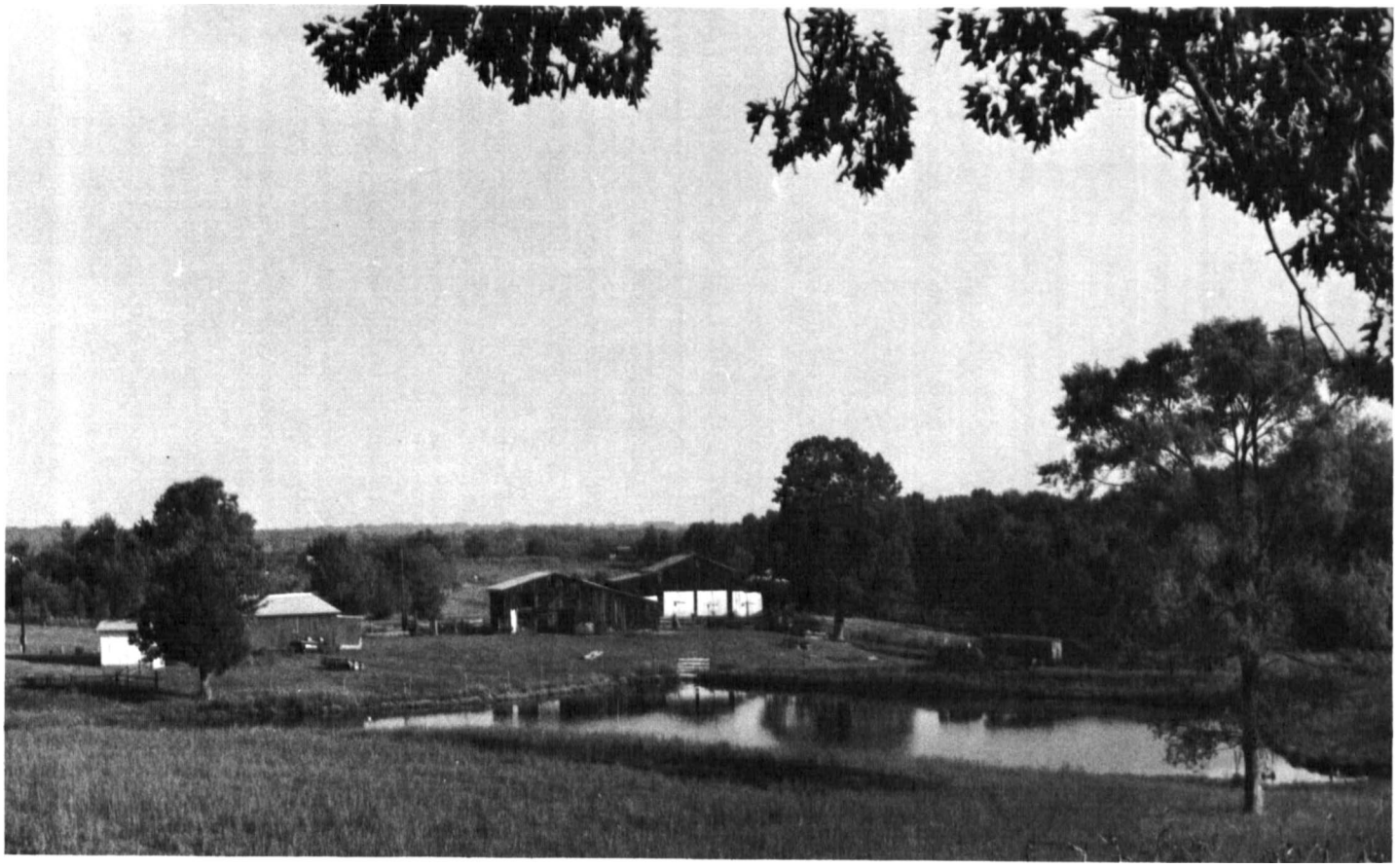


Figure 14.—Farm buildings on Loring silt loam, 2 to 6 percent slopes. The pond supplies water to livestock and is also used for recreation.

size, shape, and slope. This soil is well suited to hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a severe hazard if this soil is cultivated. Minimum tillage and the use of cover crops help to control erosion.

This soil is suited to cherrybark oak, yellow-poplar, southern red oak, sweetgum, and loblolly pine trees. Plant competition is the main concern in the management of woodland.

This soil is suitable for most urban uses. However, the moderately slow permeability of the fragipan in the subsoil is a limitation for septic tank absorption fields.

This soil is in capability subclass IIIe and woodland group 3o.

MaC—Markland silty clay loam, 6 to 12 percent slopes. This deep, moderately well drained to well drained, sloping soil is on short side slopes of stream terraces. Ditches and small streams dissect some areas. Areas range from 3 to 100 acres.

Typically, the surface layer is yellowish brown silty clay loam about 7 inches thick. The subsoil extends to a depth of 44 inches. It is yellowish brown silty clay loam to a depth of 14 inches and yellowish brown silty clay to a depth of 44 inches. The substratum between a depth of 44 and 60 inches is yellowish brown clay that has gray and brown mottles.

This soil is moderately low in natural fertility and low in content of organic matter. It is strongly acid to a depth of about 3 feet and neutral to moderately alkaline below 3 feet. The permeability is slow, and the available water capacity is moderate. Surface runoff is rapid. Most of the original surface has been removed by erosion. The root zone is deep, but it is difficult for plant roots to penetrate. Tilth is poor. The shrink-swell potential is high. The seasonal high water table is at a depth of 3 to 6 feet. Most areas of this soil are subject to occasional flooding in winter and spring.

Included with this soil in mapping are areas of Collins and McGary soils. Also included are areas of Markland soils that have a silt loam surface layer. The included soils make up less than 5 percent of the map unit. Areas are less than 2 acres.

Most of the acreage of this Markland soil has been used for farming, but many areas are now idle. The soil is poorly suited to row crops and small grain, but it is

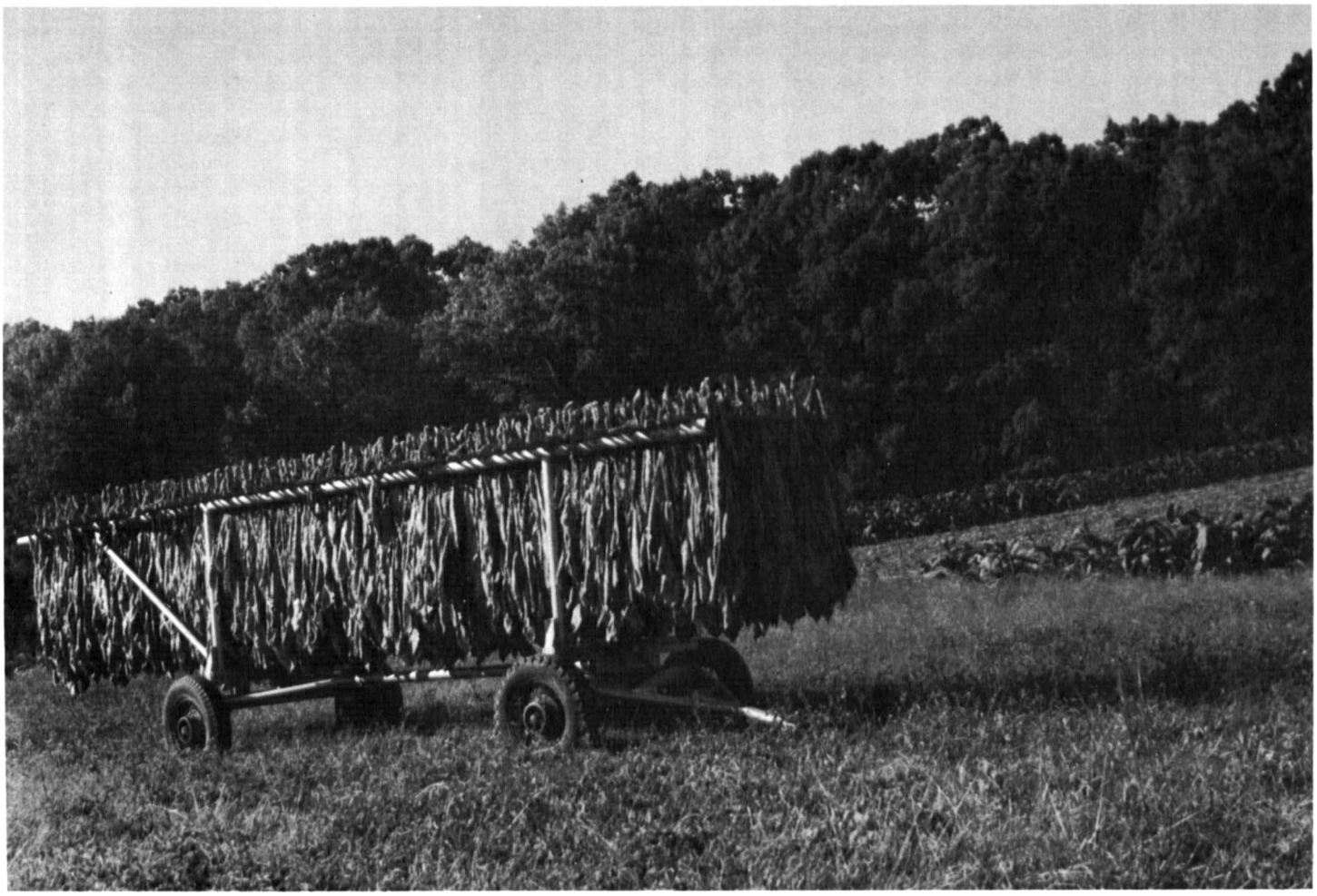


Figure 15.—Dark, air-cured tobacco in an area of Loring silt loam, 2 to 6 percent slopes.

suitable for hay and pasture. Erosion is a very severe hazard and is difficult to control.

This soil is well suited to white oak, eastern white pine, yellow-poplar, and white ash trees. Limitations to use of equipment and plant competition are the main concerns in management.

This soil has poor suitability for most urban uses. The hazard of flooding and the high shrink-swell potential of the clayey soil are severe limitations for buildings, roads, and septic tank absorption fields. These limitations are very difficult to overcome.

This soil is in capability subclass VIe and woodland group 2c.

Md—Markland-Collins complex. This complex consists of small areas of Markland and Collins soils that are too narrow to map separately at the scale selected for mapping. The deep, moderately well drained and well drained Markland soil is on the sides of dissected areas, and the deep, moderately well drained Collins soil is on nearly level flood plains. Most areas are near the mouths of small streams. Slopes range from 0 to 30 percent. Areas are 10 to 45 acres.

Markland silt loam makes up about 52 percent of this complex. Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsoil extends to a depth of 44 inches. It is yellowish brown silty clay loam to a depth of 14 inches and yellowish brown silty clay to a depth of 44 inches. The substratum between a depth of 44 and 60 inches is yellowish brown clay that has mottles in shades of brown and gray.

The Markland soil is moderately low in natural fertility and low in content of organic matter. It is strongly acid to a depth of about 32 inches and neutral to moderately alkaline between a depth of 32 and 60 inches. The permeability is slow, and the available water capacity is moderate. The root zone is deep, but penetration by plant roots is difficult. The seasonal high water table is at a depth of 3 to 6 feet. The shrink-swell potential of the clayey subsoil is high. This Markland soil is subject to occasional flooding.

Collins silt loam makes up about 26 percent of this complex. Typically, the surface layer is brown silt loam about 9 inches thick. The substratum is brown or pale brown silt loam mottled in shades of gray and brown to a depth of 48 inches and gray silt loam mottled in shades of brown between a depth of 48 and 60 inches.

The Collins soil is medium in natural fertility and moderate in content of organic matter. It is very strongly acid or strongly acid throughout unless the surface layer has been limed. The permeability is moderate, and the available water capacity is high. This soil has good tilth and can be cultivated throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots. The seasonal high water table is at a depth of 2 to 5 feet. This Collins soil is subject to occasional flooding.

Included with this complex in mapping are small areas of the well drained Huntington soils and areas of the moderately well drained Otwell soils near the Green River.

Most areas of this complex are in woodland. A few small areas are used for row crops or pasture. These soils are poorly suited to row crops, small grain, hay, and pasture because of the hazard of being flooded in winter and spring, the short steep slopes, and the included, crooked stream channels.

The Markland soil in this complex is well suited to eastern white pine, yellow-poplar, and white ash trees. The Collins soil is well suited to green ash, eastern cottonwood, and cherrybark oak trees. Plant competition is a concern in management of both soils. In addition, the hazard of erosion and equipment limitations are concerns in management of the Markland soil.

This complex has poor suitability for urban use. The hazard of flooding and steep slopes are the main limitations.

This complex is in capability subclass VIIe. The Markland soil is in woodland group 2c, and the Collins soil is in woodland group 1o.

Mg—McGary silt loam. This deep, somewhat poorly drained, nearly level soil is on stream terraces. It formed in clayey alluvium deposited in slack water. Sloughs, ditches, and small streams dissect some areas. Slopes are smooth and range from 0 to 3 percent. Areas range from 5 to 700 acres.

Typically, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsurface layer is light brownish gray silt loam 3 inches thick. The subsoil extends to a depth of 41 inches. It is yellowish brown silty clay loam or silty clay that has gray mottles to a depth of 16 inches and clay to a depth of 41 inches. The substratum between a depth of 41 and 60 inches is grayish brown clay that has olive brown mottles.

This soil is low in natural fertility and content of organic matter. It is medium acid to very strongly acid unless limed. The permeability is moderately slow in the upper part and slow or very slow in the lower part. The available water capacity is moderate. Tilth is good. Some clayey spots, however, have poor tilth and cultivating when the soil is too wet causes crusting and clodding. The clayey root zone is deep, but penetration by plant roots is difficult. Flooding is unlikely but possible under abnormal conditions. The seasonal high water table is at a depth of 1 foot to 3 feet. The shrink-swell potential is high.

Included with this soil in mapping are areas of Belknap silt loam. Also included are areas of Karnak soils that have a silty clay surface layer and a few severely eroded areas of McGary soils. The included soils make up 5 to 10 percent of the map unit. Areas are less than 3 acres.

Most of the acreage of this McGary soil is used for woodland. Some areas are used for corn, soybeans, or pasture. The soil is suited to row crops, hay, pasture, and small grain. Wetness and the high content of clay are limitations. Tilth can be maintained or improved by returning crop residue to the soil.

This soil is suited to eastern white pine, baldcypress, white ash, yellow-poplar, American sycamore, and red maple trees. Equipment limitations and plant competition are the main concerns in the management of woodland.

This soil has poor suitability for most urban uses. The hazard of flooding, high shrink-swell potential, and wetness are limitations that are difficult to overcome. The slow permeability of the clayey subsoil is a severe limitation for septic tank absorption fields.

This soil is in capability subclass IIIw and woodland group 3w.

Mm—Melvin silty clay loam. This deep, poorly drained, nearly level soil is on flood plains of the Ohio River. Areas are mostly long, narrow sloughs. Slopes range from 0 to 2 percent. Areas range from 3 to 90 acres.

Typically, the surface layer is dark gray to gray silty clay loam about 9 inches thick. The subsoil to a depth of 38 inches is gray silty clay loam mottled in shades of brown. The substratum to a depth of 60 inches is gray silty clay loam mottled with yellowish brown and gray.

This soil is medium in natural fertility and low in content of organic matter. It is medium acid to neutral. The permeability is moderate, and the available water capacity is high. The soil has good tilth. The root zone is deep, but roots are restricted by the seasonal high water table at a depth of less than 12 inches. Most areas are flooded occasionally for brief periods in winter and spring.

Included with this soil in mapping are areas of soils that have a surface layer of silt loam. Also included are areas of Newark and Weinbach soils. The included soils make up 5 to 10 percent of this map unit. Areas are less than 4 acres.

Most of the acreage of this Melvin soil is used for woodland. Some areas have been drained and are used for corn or soybeans. The soil is suited to row crops, but it is poorly suited to small grain. If adequate drainage is

provided, high yields can be obtained. The hazard of flooding and the high water table are limitations. This soil is suited to hay and pasture. Tilth can be improved by returning crop residue to the soil.

This soil is well suited to pin oak, baldcypress, eastern cottonwood, and sweetgum trees. Equipment limitations, seedling mortality, and plant competition are the main concerns in woodland management.

This soil has poor suitability for most urban uses. Flooding and wetness are severe limitations for buildings, roads, and septic tank absorption fields. The hazard of flooding is difficult and expensive to overcome.

This soil is in capability subclass IIIw and woodland group 1w.

Mn—Melvin silty clay loam, ponded. This deep, poorly drained, nearly level soil is on flood plains. Water is on the surface or very near the surface throughout the year. Most areas are old river channels (oxbows), or mine sinks. Slopes range from 0 to 2 percent.

Typically, the surface layer is dark gray or gray silty clay loam 9 inches thick. The subsoil to a depth of 38 inches is gray silty clay loam that has brown and yellowish brown mottles. The substratum to a depth of 60 inches is gray silty clay loam that has yellowish brown mottles.

This soil is medium in natural fertility and low in content of organic matter. It is medium acid to neutral throughout. The permeability is moderate, and the available water capacity is high. This soil is subject to frequent flooding. The seasonal high water table is on or near the surface.

Included with this Melvin soil in mapping are areas of soils that have a surface layer of silt loam. Also included are areas of Waverly soils that have less clay and more silt and are more acid than the Melvin soils. The included soils make up less than 15 percent of the map unit.

This Melvin soil is poorly suited to all cultivated crops, hay, and pasture plants commonly grown in the area. If adequately drained, however, high yields can be obtained. Use of this soil is limited because of ponding and the hazard of flooding.

This soil is well suited to baldcypress trees. The frequency of flooding and ponding makes it poorly suited to most other trees.

This soil has poor suitability for most urban uses because of the hazard of flooding and ponding. It is well suited to the development of habitat for wetland wildlife.

This soil is in capability subclass Vw and woodland group 1w.

MoB—Memphis silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. Shallow drainageways dissect some areas. Slopes are smooth. Areas range from 5 to 300 acres.

Typically, the surface layer is brown silt loam 6 inches thick. The subsoil extends to a depth of 43 inches. It is yellowish brown silt loam to a depth of 15 inches and brown silty clay loam to a depth of 43 inches. The substratum to a depth of 60 inches is brown silt loam.

This soil is medium in natural fertility and low in content of organic matter. It is medium acid to very strongly acid throughout unless the surface layer has been limed. The permeability is moderate, and the available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are areas of severely eroded Memphis soils that have a surface layer of silty clay loam. Also included are areas of Loring and Wellston soils. The included soils make up 5 to 10 percent of some parts of the map unit. However, these areas generally are less than 4 acres.

Most areas of this Memphis soil are used for farming. A few narrow ridgetops are wooded. The soil is used for corn, soybeans, pasture, and meadow. It is well suited to row crops and small grain, hay, and pasture. Good tilth is easily maintained by returning crop residue to the soil. The hazard of erosion is moderate if the soil is cultivated. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, reduce runoff and help to control erosion.

This soil is well suited to cherrybark oak, yellow-poplar, loblolly pine, and sweetgum trees. Plant competition is the main concern in the management of woodland.

This soil has good suitability for urban uses. Because erosion is a moderate hazard on construction sites, temporary erosion control measures may be needed during the construction period.

This soil is in capability subclass IIe and woodland group 2o.

MoC—Memphis silt loam, 6 to 12 percent slopes. This deep, well drained, sloping soil is on uplands. Many areas are dissected by shallow drainageways and small streams. Areas range from 4 to 150 acres.

Typically, the surface layer is brown silt loam 6 inches thick. The subsoil extends to a depth of 43 inches. It is yellowish brown silt loam to a depth of 15 inches and brown silty clay loam to a depth of 43 inches. The substratum to a depth of 60 inches is brown silt loam.

This soil is medium in natural fertility and low in content of organic matter. It is medium acid to very strongly acid throughout unless the surface layer has been limed. The permeability is moderate, and the available water capacity is high. The soil has good tilth and can be worked throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are areas of severely eroded Memphis soils that have a surface layer of silty clay loam. Also included are areas of Loring and Wellston soils. The included soils make up 5 to 10

percent of some parts of the map unit. However, these areas generally are less than 4 acres.

Most areas of this Memphis soil are used for farming. The soil is suited to row crops and small grain, and high yields can be obtained. The hazard of erosion is severe. This soil is well suited to hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, reduce runoff and help to control erosion.

This soil is well suited to cherrybark oak, yellow-poplar, loblolly pine, and sweetgum trees. Plant competition is the main concern in the management of woodland.

This soil is suitable for most urban uses. The steepness of slope is the main limitation. Erosion control measures are needed at construction sites.

This soil is in capability subclass IIIe and woodland group 2o.

MpC3—Memphis silty clay loam, 6 to 12 percent slopes, severely eroded. This deep, well drained, sloping soil is on uplands. It is severely eroded, and the plow layer is mostly made up of subsoil. Most areas are dissected by shallow drainageways and small streams, and some areas have shallow gullies. Areas range from 4 to 150 acres.

Typically, the surface layer is yellowish brown silty clay loam 7 inches thick. The subsoil to a depth of about 40 inches is brown silty clay loam. The substratum is brown silt loam between a depth of 40 and 60 inches.

This soil is medium in natural fertility and low in content of organic matter. It is medium acid to very strongly acid throughout unless the surface layer has been limed. The permeability is moderate, and the available water capacity is high. The soil has poor tilth and tends to crust and clod if cultivated when the moisture content is too high. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are areas of Memphis soils that have a surface layer of silt loam and a few small areas that have shallow gullies. Also included are areas of Loring and Wellston soils. The included soils make up 10 to 15 percent of this map unit. Areas are generally less than 4 acres.

Most areas of this Memphis soil are used for farming. The soil is used mostly for pasture, hay, and small grain, but some areas are used for corn and soybeans. It is suited to row crops and small grain, and moderate yields can be obtained, but use for row crops is limited because of past erosion and the very severe hazard of erosion. Hay and pasture plants grow well. Tilth can be improved by returning crop residue to the soil. If this soil is cultivated, erosion control measures are needed to reduce runoff and help control erosion.

This soil is well suited to cherrybark oak, yellow-poplar, loblolly pine, and sweetgum trees. Plant competition is the main concern in the management of woodland.

This soil is suitable for most urban uses. The steepness of slope is the main limitation. Erosion control measures are needed at construction sites.

This soil is in capability subclass IVe and woodland group 2o.

MpD3—Memphis silty clay loam, 12 to 30 percent slopes, severely eroded. This deep, well drained, severely eroded soil is on uplands. Most areas are dissected by shallow drainageways and small streams. The plow layer is mostly made up of subsoil. Some areas have shallow gullies. Areas range from 4 to 230 acres.

Typically, the surface layer is yellowish brown silty clay loam 7 inches thick. The subsoil to a depth of about 40 inches is brown silty clay loam. The substratum to a depth of 60 inches is brown silt loam.

The soil is medium in natural fertility and low in content of organic matter. It is medium acid to very strongly acid throughout unless the surface layer has been limed. The permeability is moderate, and the available water capacity is high. Erosion has removed the original surface layer. This soil has poor tilth and tends to crust and clod if cultivated when the moisture content is too high. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are some areas of uneroded soils that have a surface layer of silt loam and a few small areas that have shallow gullies. Also included are areas of Wellston and Frondorf soils. The included soils make up less then 10 percent of this map unit. Areas are generally less than 3 acres.

Most areas of this Memphis soil are used for pasture or trees. Some areas are used only by wildlife. The soil is poorly suited to row crops and small grain. The steepness of slope, past erosion, and the very severe hazard of erosion are limitations for cultivated crops. This soil is suited to hay and pasture. Tilth can be improved by returning crop residue to the soil.

This soil is well suited to cherrybark oak, yellow-poplar, loblolly pine, and sweetgum trees. Plant competition is the main concern in the management of woodland, but the hazard of erosion and limited use of equipment are concerns on the steepest parts of the map unit.

This soil has poor suitability for most urban uses. The steepness of slope is the main limitation.

This soil is in capability subclass VIe and woodland group 2o.

Ne—Newark silty clay loam. This deep, somewhat poorly drained, nearly level soil is on the Ohio River flood plain. Many areas are dissected by drainage ditches and small streams. Floods are likely to occur in winter and spring. Slopes are smooth and range from 0 to 2 percent. Areas range from 10 to 300 acres.

Typically, the surface layer is dark grayish brown silty clay loam 8 inches thick. The subsoil extends to a depth

of 43 inches. It is dark grayish brown silty clay loam mottled in shades of brown and gray to a depth of 13 inches and gray silty clay loam mottled in shades of brown to a depth of 43 inches. The substratum to a depth of 60 inches is gray silty clay loam mottled with yellowish brown.

This soil is medium in natural fertility and low in content of organic matter. It is medium acid to mildly alkaline. The permeability is moderate, and the available water capacity is high. Tilth is good. The root zone is deep and is easily penetrated by plant roots, but it is somewhat restricted by the seasonal high water table at a depth of 0.5 foot to 1.5 feet. This soil is subject to occasional flooding.

Included with this soil in mapping are areas of Melvin, Lindside, and Weinbach soils. The included soils make up less than 10 percent of this map unit. Areas are less than 4 acres.

Most of the acreage of this Newark soil has been cleared, drained, and planted to corn or soybeans. Some areas remain in native hardwoods. This soil is suited to row crops, but it is not so well suited to small grain, hay, and pasture because of the hazard of flooding and the seasonal high water table. However, if the soil is protected from flooding and drained, it is well suited to these uses. Erosion is not a hazard. Drainage is an important part of good management. Tilth can be maintained or improved by returning crop residue to the soil.

This soil is well suited to pin oak, sweetgum, eastern cottonwood, loblolly pine, red maple, eastern white pine, yellow-poplar, and American sycamore trees. Plant competition and limited use of equipment are the main concerns in management.

This soil has poor suitability for most urban uses. The hazard of flooding and a seasonal high water table are severe limitations.

This soil is in capability subclass IIw and woodland group 1w.

No—Nolin silty clay loam. This deep, well drained, nearly level soil is on the Ohio River flood plain. Some areas are dissected by drainage ditches and small streams. Slopes are 0 to 2 percent. Areas range from 5 to 308 acres.

Typically, the surface layer is brown silty clay loam 10 inches thick. The subsoil to a depth of 52 inches and the substratum to a depth of 60 inches are brown silty clay loam.

This soil is high in natural fertility and medium in content of organic matter. The permeability is moderate, and the available water capacity is high. Reaction ranges from medium acid to mildly alkaline. The root zone is deep. Tilth is fair. The plow layer tends to crust and clod if the soil is cultivated when it is too wet. This soil is subject to occasional flooding. The seasonal high water table is at a depth of 3 to 6 feet.

Included with this soil in mapping are areas of Huntington and Lindside soils. The included soils make up 5 to 10 percent of the map unit. Areas generally are less than 2 acres.

Most of the acreage of this Nolin soil is planted to corn or soybeans. A few small areas remain in native hardwoods. This soil is well suited to row crops, but it is not so well suited to small grain, hay, or pasture because of flooding. Tilth can be improved by returning crop residue to the soil. Driftwood and other debris have been left on some areas by receding floodwaters.

This soil is well suited to sweetgum, eastern cottonwood, yellow-poplar, eastern white pine, white ash, and cherrybark oak trees. Plant competition is the main concern in the management of woodland.

This soil has poor suitability for most urban uses unless protection from flooding is provided by floodwalls or levees.

This soil is in capability class I and woodland group 1o.

OtA—Otwell silt loam, 0 to 2 percent slopes. This deep, moderately well drained, nearly level soil is on stream terraces. Areas are frequently dissected by ditches, sloughs, or small streams. Slopes are uniform. Areas are 8 to 20 acres.

Typically, the surface layer is dark grayish brown silt loam 8 inches thick. The subsoil extends to a depth of 45 inches. It is brown to yellowish brown silty clay loam to a depth of 23 inches, and a very firm, compact, brittle fragipan of yellowish brown silty clay loam that has gray mottles between a depth of 23 and 45 inches. The substratum to a depth of 60 inches is yellowish brown silty clay loam that has gray mottles.

This soil is medium in natural fertility and low in content of organic matter. It is medium acid to very strongly acid throughout unless the surface layer has been limed. The permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate. This soil is easy to till if the moisture content is favorable. However, it is wet for long periods during winter and early in spring. The vertical movement of roots and water is restricted by the fragipan at a depth of about 23 inches. Most areas are subject to rare flooding in winter and spring. The seasonal high water table is at a depth of 1.5 to 3 feet.

Included with this soil in mapping are areas of Wheeling and Weinbach soils. The included soils make up less than 5 percent of this map unit.

Most areas of this Otwell soil are planted to corn or soybeans. A few small areas remain in native hardwoods. The soil is well suited to row crops, but it is not so well suited to small grain, hay, and pasture because of the hazard of flooding and wetness during the winter months. This soil is not suited to deep rooted crops.

This soil is suited to white oak, white ash, eastern white pine, and yellow-poplar trees. Plant competition is the main concern in the management of woodland.

This soil has poor suitability for most urban uses because of the hazard of flooding. The slow permeability

of the fragipan is a severe limitation for septic tank absorption fields.

This soil is in capability subclass IIw and woodland group 3o.

OtB—Otwell silt loam, 2 to 6 percent slopes. This deep, moderately well drained, gently sloping soil is on terraces of larger streams. Shallow drainageways cross many areas. Slopes are smooth. Areas are 8 to 32 acres.

Typically, the surface layer is dark grayish brown silt loam 8 inches thick. The subsoil extends to a depth of 45 inches. It is brown to yellowish brown silty clay loam to a depth of 23 inches, and a very firm, brittle, compact fragipan of yellowish brown silty clay loam that has gray mottles between a depth of 23 and 45 inches. The substratum to a depth of 60 inches is yellowish brown silty clay loam that has gray mottles.

This soil is medium in natural fertility and low in content of organic matter. It is medium acid to very strongly acid throughout unless the surface layer has been limed. The permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate. This soil is easy to till if the moisture content is favorable. However, the soil is wet for long periods in winter and spring. The vertical movement of roots, air, and water is restricted by the fragipan at a depth of about 23 inches. This soil is subject to rare flooding. The seasonal high water table is at a depth of 1.5 to 3 feet.

Included with this soil in mapping are areas of Wheeling soils and areas of severely eroded soils. The included soils make up less than 5 percent of this map unit.

Most areas of this Otwell soil are planted to corn or soybeans. A few small areas remain in native hardwoods. The soil is well suited to row crops, but it is not so well suited to small grain, hay, and pasture because of the hazard of flooding and seasonal wetness. The hazard of erosion is moderate. Crops respond well to applications of lime and fertilizer. This soil is not suited to deep rooted crops. Good tilth can be maintained by the use of grasses and legumes in the cropping system and by returning crop residue to the soil.

This soil is suited to white oak, white ash, eastern white pine, and yellow-poplar trees. Plant competition is the main concern in the management of woodland.

This soil has poor suitability for most urban uses because of the hazard of flooding. The slow permeability of the fragipan layer is a severe limitation for septic tank absorption fields.

This soil is in capability subclass IIe and woodland group 3o.

Pa—Patton silt loam. This deep, poorly drained, nearly level soil is on stream terraces. Some areas are dissected by drainage ditches. Slopes are uniform and range from 0 to 2 percent.

Typically, the surface layer is very dark grayish brown silt loam about 23 inches thick. The subsoil to a depth of 42 inches is dark grayish brown silty clay loam that has olive brown mottles. The substratum to a depth of 60 inches is dark gray silty clay loam that has olive brown mottles.

This soil is high in natural fertility and content of organic matter. Reaction ranges from slightly acid to moderately alkaline. The permeability is moderate, and the available water capacity is high. The soil has good tilth and can be cultivated throughout a wide range of moisture content. Depth of the root zone varies with the seasonal water table that is at a depth of 0 to 2 feet. This soil is subject to rare flooding.

Included with this soil in mapping are small areas of Uniontown and Henshaw soils. Also included are small areas of Patton soils that have a surface layer of silty clay loam. The included soils make up less than 15 percent of this map unit.

Most areas of this Patton soil are used for farming. The soil is well suited to row crops, hay, and pasture. Good tilth is easily maintained by returning crop residue to the soil. Minimum tillage and the use of grasses and legumes in the cropping system help to maintain good tilth.

Although all areas have been cleared and are used for cultivated crops, this soil is also well suited to eastern white pine, baldcypress, red maple, white ash, and sweetgum trees. Limited use of equipment, seedling mortality, and plant competition are the main concerns in the management of woodland.

This soil has poor suitability for most urban uses. Wetness and the hazard of flooding when unusual storms occur are limitations. The moderate permeability and a seasonal high water table at a depth of 0 to 2 feet are severe limitations for some uses. The potential is good for openland and wetland wildlife habitat.

This soil is in capability subclass IIw and woodland group 2w.

Po—Patton silt loam, overwash. This deep, poorly drained, nearly level soil is on low terraces along small streams. Drainage ditches and small streams dissect some areas. Slopes are uniform and range from 0 to 2 percent. Areas range from 5 to 500 acres.

Typically, the surface layer is overwash material of brown silt loam 9 inches thick. The subsurface layer is 14 inches thick. It is very dark gray silt loam that has very dark grayish brown mottles. The subsoil to a depth of 42 inches is dark grayish brown silty clay loam that has light olive brown mottles. The substratum to a depth of 60 inches is dark gray silty clay loam that has light olive brown mottles.

This soil is high in natural fertility. The surface layer is low in content of organic matter, but the dark layer below the surface layer is high in content of organic matter. Reaction ranges from slightly acid to moderately alkaline. The permeability is moderate, and the available

water capacity is high. This soil has good tilth and a deep root zone. The soil is subject to occasional flooding. The seasonal high water table is at a depth of 0 to 2 feet.

Included with this soil in mapping are areas of Uniontown, Henshaw, Wakeland, and Wilbur soils. The included soils make up 5 to 10 percent of the map unit. Areas are less than 2 acres.

Most areas of this Patton soil are used for farming. The soil is well suited to row crops, hay, and pasture, and high yields can be obtained. It is limited for winter crops because of wetness and flooding in winter and spring. Good tilth is easily maintained by returning crop residue to the soil.

Although all areas are used for cultivated crops, this soil is well suited to eastern white pine, baldcypress, red maple, white ash, and sweetgum trees. Seedling mortality, plant competition, and limited use of equipment are the main concerns in the management of woodland.

This soil has poor suitability for most urban uses. Wetness and the hazard of flooding are severe limitations. The potential is good for openland and wetland wildlife habitat.

This soil is in capability subclass IIw and woodland group 2w.

Ro—Robinsonville fine sandy loam. This deep, well drained, nearly level soil is on the Ohio River flood plain. Slopes are uniform and range from 0 to 2 percent. Areas range from 10 to 100 acres.

Typically, the surface layer is dark grayish brown fine sandy loam 10 inches thick. The substratum to a depth of 60 inches is brown, stratified fine sandy loam and loamy fine sand.

This soil is medium in natural fertility and low in content of organic matter. Reaction ranges from slightly acid to moderately alkaline. This soil has good tilth and can be cultivated throughout a wide range of moisture content. The permeability is moderate to moderately rapid, and the available water capacity is high. The root zone is deep and is easily penetrated by plant roots. This soil is subject to occasional flooding. The seasonal high water table is at a depth of 4 to 6 feet.

Included with this soil in mapping are areas of Huntington soil that have a surface layer of silt loam and Nolin soils that have a surface layer of silty clay loam. The included soils make up 5 to 10 percent of this map unit.

Most of the acreage of this Robinsonville soil is planted to corn. Some areas are in trees. The soil is well suited to row crops, but it is less well suited to small grain, hay, and pasture because of the hazard of flooding. Good tilth is easily maintained by returning crop residue to the soil.

This soil is well suited to eastern cottonwood, sweetgum, and American sycamore trees. Plant competition is the main concern in the management of woodland.

This soil has poor suitability for most urban uses because of the hazard of flooding.

This soil is in capability class I and woodland group 1o.

SnE—Steinsburg-Frondorf complex, 20 to 50 percent slopes. This complex consists of small, narrow areas of Steinsburg and Frondorf soils that are so intermingled that they could not be separated at the scale selected for mapping. These soils are moderately deep and well drained. They are on upland hillsides dissected by intermittent drainageways. Areas range from 4 to 200 acres.

Steinsburg loam makes up about 42 percent of this complex. Typically, the surface layer is dark grayish brown loam 3 inches thick. The subsurface layer is brown loam 2 inches thick. The subsoil to a depth of 19 inches is yellowish brown loam. The substratum between a depth of 19 and 27 inches is strong brown gravelly fine sandy loam. Sandstone bedrock is at a depth of 27 inches.

The Steinsburg soil is medium in natural fertility and low in content of organic matter. It is strongly acid or very strongly acid throughout. The permeability is moderately rapid, and the available water capacity is moderate. This soil has good tilth and a moderately deep root zone. The depth to bedrock ranges from 24 to 40 inches.

Frondorf silt loam makes up about 26 percent of this complex. Typically, the surface layer is very dark grayish brown silt loam 3 inches thick. The subsurface layer is grayish brown silt loam 3 inches thick. The subsoil extends to a depth of 25 inches. It is light yellowish brown silt loam to a depth of 14 inches and strong brown channery silty clay loam to a depth of 25 inches. The substratum between a depth of 25 to 28 inches is yellowish brown channery silty clay loam. Sandstone bedrock is at a depth of 28 inches.

The Frondorf soil is medium in natural fertility and low in content of organic matter. It is strongly acid or very strongly acid throughout unless it has been limed. The permeability and the available water capacity are moderate. This soil has good tilth and a moderately deep root zone. The depth to bedrock ranges from 20 to 40 inches.

Included with this complex in mapping are small areas of the well drained Wellston soils. Also included are areas of rock outcrop and soils that are less than 20 inches to bedrock.

This Steinsburg-Frondorf complex is poorly suited to cultivated crops because of the steep slopes, a very severe hazard of erosion, and outcrops of rock.

The Steinsburg soil is suited to eastern white pine, Virginia pine, and shortleaf pine trees. The north-facing slopes of the Frondorf soil are well suited to yellow-poplar, shortleaf pine, black walnut, eastern white pine, and loblolly pine. The south-facing, warm slopes are suited to Virginia pine, shortleaf pine, and loblolly pine.

The hazard of erosion, limitations to use of equipment, seedling mortality, and plant competition are the concerns in the management of woodland.

This complex has poor suitability for most urban uses because of the steep slopes and moderate depth to bedrock. The soils are best suited to woodland and habitat for woodland wildlife.

This complex is in capability subclass VIIe. The Frondorf soil is in woodland group 2r, north aspect, and 3r, south aspect. The Steinsburg soil is in woodland group 3f.

Ud—Udorthents, steep. These soils consist of material moved by machines in the process of uncovering coal. The veins of coal were mostly at a depth ranging from 15 to 125 feet. This removed material was deposited in steep ridges that have short slopes generally ranging between 2 and 80 percent. Coarse fragments in the upper few feet of the material range between 10 and 90 percent.

The natural fertility of these soils is not known. However, reaction ranges from extremely acid to neutral. Very often, both extremes of reaction occur within a few feet of each other owing to the random placement of material from different geologic strata. These soils have poor tilth and medium to low available water capacity.

Some areas of these soils have been reshaped and graded. Other areas include fairly large pits that contain water. The water is commonly toxic to aquatic life for many years after mining operations have ceased.

Included with these soils in mapping are small areas of undisturbed soils. The included soils make up less than 10 percent of the map unit. Areas of water make up about 5 percent.

Most of the acreage of Udorthents, steep, soils is idle. However, a few small areas are used for pasture. The soils are poorly suited to cultivated crops and pasture because of the high content of stones, low available water capacity, and steep slopes. Such limitations are difficult and expensive to overcome. A few small areas have been reshaped, limed, and seeded to grasses and legumes. However, growth of vegetation is restricted.

These soils are suited to a few species of trees. Pines, locust, and cottonwood grow best. Steep slopes and the uneven topography are limitations for woodland use and management.

These soils have poor suitability for most urban uses. Steep slopes and stoniness are the main limitations. Because of uneven settling, the soil material provides poor foundations for buildings and other structures. Some areas have potential as habitat for openland wildlife and for recreation use.

These soils are not assigned to a capability subclass or woodland group.

UnA—Uniontown silt loam, 0 to 2 percent slopes. This deep, moderately well drained to well drained, nearly level soil is on stream terraces. Areas are 10 to 40 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil to a depth of 34 inches is yellowish brown silty clay loam. The substratum to a depth of 60 inches is light olive brown silt loam to silty clay loam.

This soil is medium in natural fertility and low in content of organic matter. The permeability is moderate to moderately slow, and the available water capacity is high. This soil is strongly acid through slightly acid to a depth of 34 inches and neutral through moderately alkaline to a depth of 60 inches or more. It has good tilth and can be cultivated throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots. Most areas are subject to rare flooding. The seasonal high water table is at a depth of 2.5 to 6 feet.

Included with this soil in mapping are small areas of Uniontown soils that have a surface layer of silty clay loam. Also included are areas of Henshaw and Patton soils. The included soils make up about 5 percent of this map unit. Areas are less than 2 acres.

Most areas of this Uniontown soil are used for farming. Some areas are used for nursery plants or urban development. This soil is suited to row crops and small grain. However, the shape of the areas, wetness, and the hazard of flooding on adjacent soils are limitations. The soil is well suited to hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Minimum tillage and the use of grasses and legumes in the cropping system help to maintain good tilth and high yields.

This soil is well suited to northern red oak, yellow-poplar, sweetgum, eastern white pine, and black walnut trees. Plant competition is the main concern in the management of woodland.

This soil has poor suitability for most urban uses because of the hazard of flooding. If adequate flood protection is provided, the soil has good suitability for urban development.

This soil is in capability class I and woodland group 2o.

UnB—Uniontown silt loam, 2 to 6 percent slopes. This deep, moderately well drained to well drained, gently sloping soil is on stream terraces. Areas range from 4 to 160 acres.

Typically, the surface layer is brown silt loam 8 inches thick. The subsoil to a depth of 34 inches is yellowish brown silty clay loam. The substratum to a depth of 60 inches is light olive brown silt loam and silty clay loam.

This soil is medium in natural fertility and low in content of organic matter. The permeability is moderate to moderately slow, and the available water capacity is high. This soil is strongly acid through slightly acid to a depth of 34 inches and neutral through moderately alkaline to a depth of 60 inches or more. It has good tilth and can be cultivated throughout a wide range of moisture content. The root zone is deep and is easily

penetrated by plant roots. Most areas of this soil are subject to rare flooding. The seasonal high water table is at a depth of 2.5 to 6 feet.

Included with this soil in mapping are small areas of Uniontown soils that have a surface layer of silty clay loam and areas of Henshaw and Patton soils. The included soils make up about 5 percent of this map unit. Areas are less than 2 acres.

Most areas of this Uniontown soil are used for farming. Some areas are used for urban development. This soil is suited to row crops and small grain. The shape of the areas, wetness, and the hazard of flooding on adjacent soils are limitations. The soil is well suited to hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Minimum tillage, no-tillage, and a cropping system that includes grasses and legumes reduce runoff and help to control erosion.

This soil is well suited to red oak, yellow-poplar, sweetgum, eastern white pine, and black walnut trees. Plant competition is the main concern in the management of woodland.

This soil has poor suitability for most urban uses because of the hazard of flooding. If adequate flood protection is provided, the soil is suited to urban development.

This soil is in capability subclass IIe and woodland group 2o.

UoC3—Uniontown silty clay loam, 6 to 12 percent slopes, severely eroded. This deep, moderately well drained to well drained, sloping soil is on sides of stream terraces. Because of past erosion, the plow layer is mostly made up of the subsoil. Areas range from 4 to 24 acres.

Typically, the surface layer and subsoil are yellowish brown silty clay loam 31 inches thick. The substratum to a depth of 60 inches is light olive brown silt loam and silty clay loam.

This soil is medium in natural fertility and low in content of organic matter. The permeability is moderate to moderately slow, and the available water capacity is high. This soil is slightly acid through strongly acid to a depth of 31 inches and neutral through moderately alkaline to a depth of 60 inches or more. The root zone is deep and is easily penetrated by plant roots. Erosion has removed the original surface layer. This soil tends to crust and clod if cultivated when it is too wet. Most areas are subject to rare flooding. The seasonal high water table is at a depth of 2.5 to 5 feet.

Included with this soil in mapping are small areas of Uniontown soils that have a surface layer of silt loam and areas that have more clay throughout than the Uniontown soil. Also included are small areas that have slopes steeper than 12 percent. A few spots have lime concretions on the surface.

Most areas of this soil are used for farming. The soil is poorly suited to row crops, but is suited to small grain, hay, and pasture. The very severe hazard of erosion is a limitation. Tilth can be improved by returning crop residue to the soil.

This soil is suited to northern red oak, loblolly pine, and Virginia pine trees. Plant competition is the main concern in the management of woodland.

This soil has poor suitability for most urban uses because of the hazard of flooding and the steepness of slope.

This soil is in capability subclass IVe and woodland group 3o.

Wa—Wakeland silt loam. This deep, somewhat poorly drained, nearly level soil is on flood plains of small streams in Union County and in the north-central part of Webster County. Areas range from 6 to 250 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer is brown silt loam 11 inches thick. The substratum extends to a depth of 60 inches or more. It is grayish brown silt loam between a depth of 11 and 33 inches and gray silt loam between a depth of 33 and 60 inches. It is mottled throughout in shades of brown and gray.

This soil is high in natural fertility and low in content of organic matter. The permeability is moderate, and the available water capacity is high. Reaction ranges from medium acid to neutral. This soil has good tilth and can be worked throughout a wide range of moisture content. The root zone is deep, but it is restricted by the seasonal high water table at a depth of 1 foot to 3 feet. This soil is subject to occasional flooding.

Included with this soil in mapping are soils that are browner throughout than the Wakeland soil. Also included are soils that are darker and have more clay. The included areas are generally less than 2 acres.

Most areas of this Wakeland soil are used for corn or soybeans. The soil is well suited to row crops, but it is not so well suited to small grain, hay, and pasture because of wetness and the hazard of flooding. Crop residue needs to be returned to the soil to help maintain good tilth. Artificial drainage helps to lower the water table and permit early planting and harvesting of crops.

This soil is well suited to pin oak, sweetgum, eastern white pine, baldcypress, American sycamore, white ash, and red maple trees. Limitations to use of equipment and plant competition are the main concerns in the management of woodland.

This soil has poor suitability for most urban uses because of the hazard of flooding and the seasonal high water table.

This soil is in capability subclass IIw and woodland group 1w.

Wb—Waverly silt loam. This deep, poorly drained, nearly level soil is on flood plains of streams in Webster County. Many areas are dissected by drainage ditches. Slopes range from 0 to 2 percent. Areas range from 10 to 90 acres.

Typically, the surface layer is brown silt loam 8 inches thick. The subsoil to a depth of 41 inches is light

brownish gray to light gray silt loam mottled in shades of brown and gray. The substratum to a depth of 62 inches is light brownish gray to light gray silt loam mottled in shades of gray and brown.

This soil is medium in natural fertility and low in content of organic matter. It is strongly acid or very strongly acid unless the surface layer has been limed. The permeability is moderate, and the available water capacity is high. The root zone is somewhat restricted by the seasonal high water table at a depth of 0.5 to 1 foot, but it is deep and is easily penetrated by plant roots. This soil has good tilth. It is subject to occasional flooding.

Included with this soil in mapping are areas of Collins and Belknap soils, which are better drained than the Waverly soil. Also included are soils that have more clay throughout. The included soils make up 5 to 10 percent of this map unit. Areas are less than 2 acres.

Most of the acreage of this Waverly soil has been cleared and drained and is used for corn and soybeans. Some areas remain in native hardwoods. The soil is suited to row crops, but it is not so well suited to small grain, hay, and pasture. Wetness and flooding (see fig. 12) are the main limitations. Drainage is needed. Tilth can be maintained or improved by returning crop residue to the soil.

This soil is well suited to water tupelo, sweetgum, willow oak, American sycamore, loblolly pine, and eastern cottonwood trees. Limitations to use of equipment, seedling mortality, and plant competition are the main concerns in the management of woodland.

This soil has poor suitability for most urban uses because of the hazard of flooding and wetness.

This soil is in capability subclass IIIw and woodland group 1w.

Wh—Weinbach silt loam. This deep, somewhat poorly drained, nearly level soil is on stream terraces of the larger streams. Some areas are dissected by drainage ditches and small streams. Slopes range from 0 to 2 percent. Areas range from 3 to 65 acres.

Typically, the surface layer is brown silt loam 9 inches thick. The subsoil extends to a depth of 49 inches. It is light brownish gray silt loam between a depth of 9 and 20 inches and a fragipan of very firm, brittle, compact light brownish gray silt loam between a depth of 20 and 49 inches. The substratum to a depth of 63 inches is brown silt loam mottled with light brownish gray.

This soil is medium in natural fertility and low in content of organic matter. It is very strongly acid or strongly acid throughout unless the surface layer has been limed. The permeability is moderate above the fragipan and very slow in the fragipan. The available water capacity is moderate. The root zone is moderately deep. The vertical movement of roots, air, and water is restricted by the fragipan. This soil is wet for long periods in winter and spring and is subject to rare flooding. The seasonal high water table is at a depth of 1 foot to 3 feet.

Included with this soil in mapping are areas of Otwell, McGary, and Melvin soils. The included soils make up less than 10 percent of this map unit. Areas are less than 2 acres.

Most areas of this Weinbach soil are planted to soybeans. A few small areas are used for pasture or remain in native hardwoods. The soil is well suited to row crops, but it is not so well suited to small grain, hay, and pasture. Wetness and the moderately deep rooting zone are limitations. Tile drainage is not always successful on this soil, but surface drainage can be used to remove some of the excess water.

This soil is well suited to eastern white pine, sweetgum, baldcypress, white ash, red maple, yellow-poplar, and American sycamore trees. Plant competition, seedling mortality, and limitations to use of equipment are the main concerns in the management of woodland.

This soil has poor suitability for most urban uses. The fragipan part of the subsoil, which is very slowly permeable, is a severe limitation for septic tank absorption fields. Flooding is a hazard in winter and spring on most areas of this soil.

This soil is in capability subclass IIIw and woodland group 2w.

WlC—Wellston silt loam, 6 to 12 percent slopes. This deep, well drained, sloping soil is on uplands. Areas are 4 to 40 acres.

Typically, the surface layer is brown silt loam 7 inches thick. The subsoil extends to a depth of 34 inches. It is yellowish brown silty clay loam between a depth of 7 and 20 inches and yellowish brown silty clay loam that has 10 percent sandstone fragments between a depth of 20 and 34 inches. The substratum to a depth of 59 inches is yellowish brown channery sandy clay loam. Sandstone bedrock is at a depth of 59 inches.

This soil is medium in natural fertility and low in content of organic matter. It is strongly acid or very strongly acid unless the surface layer has been limed. The root zone is deep. The permeability is moderate, and the available water capacity is high. This soil is easy to till.

Included with this soil in mapping are areas of Loring, Zanesville, and Frondorf soils. Loring and Zanesville soils have fragipans. Frondorf soils are less than 40 inches deep to bedrock. The included soils make up less than 10 percent of this map unit.

A few areas of this Wellston soil remain in native hardwoods, but most areas have been cleared and are used for general farming. This soil is suited to row crops, pasture, and hay. The steepness of slope, the shape and size of the areas, and the adjoining soils are limitations. Erosion is a severe hazard. If cultivated crops are grown, erosion control measures are needed.

This soil is well suited to black walnut, yellow-poplar, northern red oak, and eastern white pine trees. Plant competition is the main concern in the management of woodland.

This soil is suitable for most urban uses. The steepness of slope and depth to bedrock are the main limitations. Erosion control measures are needed during construction of roads.

This soil is in capability subclass IIIe and woodland group 2o.

WID—Wellston silt loam, 12 to 20 percent slopes. This deep, well drained, moderately steep soil is on side slopes of uplands. Slopes are commonly dissected by shallow drainageways. Areas range from 4 to 100 acres.

Typically, the surface layer is brown silt loam 7 inches thick. The subsoil extends to a depth of 34 inches. It is yellowish brown silty clay loam between a depth of 7 and 20 inches and yellowish brown silty clay loam that has 10 percent sandstone fragments between a depth of 20 and 34 inches. The substratum to a depth of 59 inches is yellowish brown channery sandy clay loam. Hard sandstone bedrock is at a depth of 59 inches.

This soil is medium in natural fertility and low in content of organic matter. It is strongly acid or very strongly acid unless the surface layer has been limed. The root zone is deep. The permeability is moderate, and the available water capacity is high. This soil is easy to till.

Included with this soil in mapping are areas of Loring, Zanesville, and Frondorf soils. Loring and Zanesville soils have fragipans. Frondorf soils are less than 40 inches deep to bedrock. The included soils make up less than 10 percent of this map unit.

Some areas of this Wellston soil remain in native hardwoods, but much of the acreage is used for pasture. The soil is poorly suited to row crops, but it is suited to small grain, hay, and pasture. The steepness of slope and the very severe hazard of erosion are limitations. Erosion control measures are needed if cultivated crops are grown. Minimum tillage, and the use of cover crops help to control erosion.

This soil is well suited to black walnut, yellow-poplar, northern red oak, and eastern white pine trees. The hazard of erosion, plant competition, and limitations to the use of equipment are the main concerns in the management of woodland.

This soil has poor suitability for most urban uses. The depth to bedrock and the steepness of slope are the main limitations. Temporary erosion control measures are needed for construction sites.

This soil is in subclass IVe and woodland group 2r.

WpC3—Wellston silty clay loam, 6 to 12 percent slopes, severely eroded. This deep, well drained, sloping soil is on uplands. The plow layer is mostly made up of subsoil. Shallow gullies are common. Slopes are convex and are dissected by shallow, intermittent drainageways. Areas range from 4 to 20 acres.

Typically, the surface layer is yellowish brown silty clay loam about 6 inches thick. The subsoil to a depth of 31 inches is yellowish brown silty clay loam that has sandstone fragments in the lower part. The substratum to a depth of 46 inches is yellowish brown channery sandy clay loam. Sandstone bedrock is at a depth of 46 inches.

This soil is medium in natural fertility and low in content of organic matter. It is strongly acid or very strongly acid unless the surface layer has been limed. The root zone is deep. The permeability is moderate, and the available water capacity is high. The original surface layer has been removed by erosion. The present surface layer has poor tilth and tends to crust and clod if it is cultivated when the moisture content is too high.

Included with this soil in mapping are areas of Loring, Zanesville, and Frondorf soils. Loring and Zanesville soils have fragipans. Frondorf soils are less than 40 inches deep to bedrock. The included soils make up less than 10 percent of this map unit.

Most areas of this Wellston soil are idle. A small acreage has been planted in pine trees. This soil is suited to pasture and hay, but it is poorly suited to row crops and small grain. Past erosion and the hazard of further erosion are limitations. Erosion control measures are needed if this soil is cultivated.

This soil is well suited to yellow-poplar, northern red oak, eastern white pine, black walnut, and Virginia pine trees. Plant competition is the main concern in the management of woodland.

This soil is suitable for most urban uses. The steepness of slope and depth to bedrock are the main limitations. Erosion control measures are needed if the soil is disturbed during construction of roads or other construction.

This soil is in capability subclass IVe and woodland group 2o.

WpD3—Wellston silty clay loam, 12 to 20 percent slopes, severely eroded. This deep, well drained, moderately steep soil is on uplands. The plow layer is mostly made up of subsoil. Shallow gullies are common. Slopes are convex and are dissected by shallow, intermittent drainageways. Areas range from 6 to 140 acres.

Typically, the surface layer is yellowish brown silty clay loam about 7 inches thick. The subsoil to a depth of 31 inches is yellowish brown silty clay loam that has 10 percent sandstone fragments in the lower part. The substratum to a depth of 46 inches is yellowish brown channery sandy clay loam. Sandstone bedrock is at a depth of 46 inches.

This soil is medium in natural fertility and low in content of organic matter. It is strongly acid or very strongly acid unless the surface layer has been limed. The permeability is moderate, and the available water capacity is high. The root zone is deep. The original surface layer has been removed by erosion. The present surface layer has poor tilth and tends to crust and clod if it is cultivated when the moisture content is too high.

Included with this soil in mapping are areas of Zanesville and Frondorf soils. Zanesville soils have a

fragipan. Frondorf soils are less than 40 inches deep to bedrock. The included soils make up less than 10 percent of this map unit.

Most of the acreage of this soil is idle. Areas are covered by second-growth trees, sagegrass, or blackberry briars.

This soil is suited to pasture and hay, but it is poorly suited to row crops and small grain. The steepness of slopes, past erosion (fig. 16), and the hazard of further erosion are limitations.

This soil is suited to yellow-poplar, northern red oak, Virginia pine, and eastern white pine trees. Limitations to use of equipment, seedling mortality, plant competition, and the hazard of erosion are the main concerns in the management of woodland.

This soil has poor suitability for most urban uses because of the steepness of slope, depth to bedrock, and past erosion. Erosion control measures are needed to control erosion at construction sites.

This soil is in capability subclass VIe and woodland group 3r.

WsA—Wheeling silt loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on stream terraces of the Ohio River and Cypress Creek. Areas range from 3 to 59 acres.

Typically, the surface layer is brown silt loam 9 inches thick. The subsoil extends to a depth of 47 inches. It is yellowish brown to dark yellowish brown silty clay loam between a depth of 9 and 31 inches and yellowish brown fine sandy loam between a depth of 31 and 47 inches. The substratum to a depth of 65 inches is yellowish brown fine sandy loam.

This soil is medium in natural fertility and low in content of organic matter. The permeability is moderate, and the available water capacity is high. Reaction ranges from medium acid to strongly acid unless the surface layer has been limed. This soil has good tilth and can be cultivated throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant

Figure 16.—Gullies in an area of Wellston silty clay loam, 12 to 20 percent slopes, severely eroded. These gullies are the result of poor soil management.

roots. The seasonal high water table is at a depth of 4 to 6 feet.

Included with this soil in mapping are areas of Ashton, Otwell, and Uniontown soils. The Otwell soils have a fragipan. The included soils make up less than 10 percent of this map unit.

Most areas of this Wheeling soil are used for farming. The soil is well suited to row crops, small grain, hay, and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is not a hazard on this nearly level soil.

This soil is well suited to black walnut, yellow-poplar, northern red oak, and eastern white pine trees. Stands of pine trees produce high yields. Plant competition is the main concern in the management of woodland.

This soil has good suitability for most urban uses. However, flooding may occur in some included, low-lying areas during high floods.

This soil is in capability class I and woodland group 2o.

WsB—Wheeling silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on stream terraces along the Ohio River and Cypress Creek. Areas range from 5 to 20 acreas.

Typically, the surface layer is brown silt loam 9 inches thick. The subsoil extends to a depth of 47 inches. It is yellowish brown to dark yellowish brown silty clay loam between a depth of 9 and 31 inches and yellowish brown fine sandy loam between a depth of 31 and 47 inches. The substratum to a depth of 65 inches is yellowish brown fine sandy loam.

This soil is medium in natural fertility and low in content of organic matter. The permeability is moderate, and the available water capacity is high. Reaction is medium acid to strongly acid unless the surface layer has been limed. This soil has good tilth and can be cultivated throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots. The seasonal high water table is at a depth of 4 to 6 feet.

Included with this soil in mapping are areas of Ashton, Otwell, and Uniontown soils. The Otwell soils have a fragipan. Also included are small areas of soils that have more than 6 percent slopes. The included soils make up less than 10 percent of this map unit.

Most areas of this soil are used for farming. The soil is well suited to row crops, small grain, hay, and pasture. The use of cover crops of grasses and legumes and the return of crop residue to the soil help to control erosion and improve tilth.

This soil is well suited to black walnut, yellow-poplar, northern red oak, and eastern white pine trees. Stands of pine produce high yields. Plant competition is the main concern in the management of woodland.

This soil has good suitability for most urban uses. Flooding may occur on a few included, low-lying areas.

This soil is in capability subclass IIe and woodland group 2o.

WtC3—Wheeling silty clay loam, 6 to 12 percent slopes, severely eroded. This deep, well drained, sloping soil is on the sides of terraces along the Ohio River and Cypress Creek. The plow layer is mostly made up of subsoil. Shallow gullies are common. Areas range from 3 to 25 acres.

Typically, the surface layer is yellowish brown silty clay loam 7 inches thick. The subsoil extends to a depth of 47 inches. It is yellowish brown silty clay loam between a depth of 7 and 31 inches and yellowish brown fine sandy loam between a depth of 31 and 47 inches. The substratum to a depth of 65 inches is yellowish brown fine sandy loam.

This soil is medium in natural fertility and low in content of organic matter. Reaction ranges from medium acid to strongly acid unless the surface layer has been limed. The permeability is moderate, and the available water capacity is high. The original surface layer has been removed by erosion. The present surface layer has good tilth and can be cultivated throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots. The seasonal high water table is at a depth of 4 to 6 feet.

Included with this soil in mapping are areas of Ashton, Otwell, and Uniontown soils. The Otwell soils have a fragipan. Also included are small areas that have more than 12 percent slopes. The included soils make up less than 10 percent of this map unit.

Most areas of this Wheeling soil are used for farming. The soil is poorly suited to row crops but is suited to small grain, hay, and pasture. The very severe hazard of erosion and past erosion are limitations. The use of cover crops of grasses and legumes and the return of crop residue to the soil help to control erosion and improve tilth.

This soil is well suited to black walnut, yellow-poplar, northern red oak, and eastern white pine trees. Stands of pine produce high yields. Plant competition is the main concern in the management of woodland.

This soil is suitable for most urban uses. The steepness of slope is a limitation. Flooding may occur in some included, low-lying areas during high flooding.

This soil is in capability subclass IVe and woodland group 2o.

Wu—Wilbur silt loam. This deep, moderately well drained, nearly level soil is on flood plains of small streams in Union County and in the north-central part of Webster County. Slopes range from 0 to 2 percent. Areas range from 10 to 150 acres.

Typically, the surface layer is brown silt loam 9 inches thick. The substratum is brown silt loam that has gray mottles to a depth of 42 inches and grayish brown silt loam mottled in shades of yellow and gray to a depth of 60 inches.

This soil is high in natural fertility and low in content of organic matter. Reaction ranges from medium acid to neutral. The permeability is moderate, and the available

water capacity is high. The soil has good tilth and can be worked throughout a wide range of moisture content. Roots readily penetrate deep into this soil. This soil is subject to occasional flooding. The seasonal high water table is within 3 to 6 feet of the surface.

Included with this soil in mapping are areas of Wakeland and Haymond soils. Also included are areas of Patton soils that are darker and have more clay than the Wilbur soils. The included areas generally are less than 2 acres.

Most areas of this Wilbur soil have been cleared and are used for corn or soybeans. The soil is well suited to row crops, but it is not so well suited to small grain, hay, and pasture because of the hazard of flooding. Crop residue should be returned to the soil to help maintain good tilth.

This soil is well suited to black walnut, eastern white pine, and yellow-poplar trees. Plant competition is the main concern in the management of woodland.

This soil has poor suitability for most urban uses because of the hazard of flooding and a seasonal high water table.

This soil is in capability class I and woodland group 1o.

ZnC—Zanesville silt loam, 6 to 12 percent slopes. This deep, moderately well drained to well drained, sloping soil is on side slopes of uplands. It has a fragipan. Slopes are dissected by drainageways. Areas range from 2 to 50 acres.

Typically, the surface layer is dark grayish brown silt loam 6 inches thick. The subsoil extends to a depth of 47 inches. It is strong brown to brown silty clay loam to silt loam to a depth of 30 inches and a fragipan of firm, compact, and brittle, yellowish brown silty clay loam that has gray mottles between a depth of 30 and 47 inches. The substratum to a depth of 69 inches is brown silty clay loam that is about 40 percent coarse fragments of sandstone and siltstone.

This soil is medium in natural fertility and low in content of organic matter. It is strongly acid or very strongly acid throughout unless the surface layer has been limed. The permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate. This soil has good tilth and can be worked throughout a wide range of moisture content. Roots and water readily penetrate this soil to the fragipan, but further vertical movement is restricted. The seasonal high water table is at a depth of 2 to 3 feet.

Included with this soil in mapping are areas of Loring, Grenada, Wellston, and Memphis soils. Also included are areas of Zanesville soils that have a surface layer of silty clay loam. The included soils make up 5 to 10 percent of most of the map unit. Areas are generally less than 3 acres.

Most areas of this Zanesville soil are used for farming. A few small areas remain in native hardwoods. The soil is suited to row crops and small grain. The size, shape, and slope of the areas are limitations. The soil is well suited to hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. The hazard of erosion is severe if this soil is cultivated. Minimum tillage, cover crops, and the use of grasses and legumes in the cropping system help to slow runoff and control erosion.

This soil is suited to northern red oak, eastern white pine, shortleaf pine, and Virginia pine trees. Plant competition is the main concern in the management of woodland.

This soil is moderately suitable for most urban uses. The slow permeability of the fragipan, wetness, and the steepness of slope are the main limitations.

This soil is in capability subclass IIIe and woodland group 3o.

ZoC3—Zanesville silty clay loam, 6 to 12 percent slopes, severely eroded. This deep, moderately well drained to well drained, sloping soil is on hillsides of uplands. It has a fragipan. The plow layer is mostly made up of subsoil. Shallow gullies are common. Some slopes are dissected by drainageways and gullies. Areas are 5 to 40 acres.

Typically, the surface layer is strong brown silty clay loam 6 inches thick. The subsoil extends to a depth of 41 inches. It is strong brown silty clay loam to a depth of 26 inches and a fragipan of firm, compact, brittle, yellowish brown silty clay loam mottled in shades of brown and gray between a depth of 26 and 41 inches. The substratum to a depth of 63 inches is brown channery silty clay loam. Sandstone bedrock is at a depth of 63 inches.

This soil is low in natural fertility and content of organic matter. It is strongly acid or very strongly acid unless the surface layer has been limed. The permeability is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate. The original surface layer has been removed by erosion. The present surface layer has poor tilth and tends to crust and clod unless it is cultivated within a narrow range of suitable moisture content. The root zone is moderately deep. Roots easily penetrate to the fragipan, but further vertical movement is restricted. The seasonal high water table is at a depth of 2 to 3 feet.

Included with this soil in mapping are uneroded spots that have a surface layer of silt loam. Also included are areas of Loring, Memphis, and Wellston soils. The included areas make up 5 to 10 percent of the map unit. Areas are commonly less than 3 acres.

Most areas of this Zanesville soil are used for farming. A few small areas are idle. Other areas are covered by second-growth trees, sagegrass, or blackberry briars. The soil is poorly suited to row crops but is suited to small grain, hay (fig. 17), and pasture. Yield is moderate. A moderately deep root zone and moderate available water capacity are limitations. Because the hazard of erosion is very severe if cultivated crops are grown, erosion control measures are essential.

Figure 17.—Large bales of Kentucky 31 fescue hay on an area of Zanesville silty clay loam, 6 to 12 percent slopes, severely eroded.

This soil is suited to northern red oak, Virginia pine, and shortleaf pine trees. Moderate seedling mortality is the main concern of woodland management.

This soil is suitable for most urban uses. The fragipan, which is slowly permeable, is a severe limitation for septic tank absorption fields. Areas of seepy spots in winter and spring result from the restricted drainage caused by the fragipan.

This soil is in capability subclass IVe and woodland group 4d.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil (*13*).

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Roscoe Isaacs, State resource conservationist, Soil Conservation Service, assisted in preparing this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Approximately 273,000 acres in Union and Webster Counties were used for crops and pasture in 1967, according to the Kentucky Soil and Water Conservation Needs Inventory (*9*). Of this total acreage, 56,000 acres was used for permanent pasture; 125,000 acres for row crops, mainly corn, soybeans, and tobacco; 16,000 acres for close-growing crops, mainly wheat; 51,000 acres for hayland and rotation hay and pasture; and 22,000 acres for conservation use only. The rest was idle cropland, orchards, and open land.

The soils in the survey area have high potential for increased production of food. At present, about 21,000 acres of potentially good cropland is in woodland, and about 22,000 acres is in pasture. In addition to the reserve productive capacity represented by this land, food production could be increased considerably by extending the latest crop production technology to all cropland in the survey area. This soil survey can help facilitate the application of such technology.

Acreage in crops and pasture increased slightly from 1958 to 1967. In 1967 there was about 12,000 acres in urban and built-up land.

Soil erosion is the major concern on about one-half of the cropland and pasture in Union and Webster Counties. If slope is more than 2 percent, erosion is a hazard. Markland, Memphis, Loring, Grenada, Otwell, Uniontown, Wellston, Wheeling, and Zanesville soils have slopes of more than 2 percent.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil such as Markland soils, and on soils that have a layer in or below the subsoil that limits depth of the root zone. Such layers include a fragipan, as in Loring, Grenada, Otwell, and Zanesville soils, or shallow bedrock, as in Steinsburg, Frondorf, and Wellston soils. Second, soil erosion on farmland results in sedimentation of streams. Control of erosion minimizes

the pollution of streams by sediment and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

In many sloping fields, tilling or preparing a good seedbed is difficult in soils that have a fragipan because the original friable surface soil has been eroded away. Such spots are common in areas of severely eroded Zanesville soils.

Erosion control measures provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods (fig. 18) can hold soil erosion losses to amounts that will not reduce the productive capacity of the soils. On livestock farms, which require pasture and hay, legume and grass forage crops in the cropping system reduce erosion on sloping land, provide nitrogen, and improve tilth for the crops that follow.

On sloping soils, a cropping system that provides substantial vegetative cover is required to control erosion unless minimum tillage is practiced. Minimizing tillage and leaving crop residue on the surface help to increase infiltration and reduce the hazards of runoff and erosion. These practices can be adapted to most soils in the survey area. No-tillage for corn, which is becoming increasingly common, is also effective in reducing erosion on sloping land.

Information for the design of erosion control measures for each kind of soil is available in local offices of the Soil Conservation Service.

Soil drainage is the major management need on about two-fifths of the acreage used for crops and pasture in the survey area. Some soils are so wet that the production of crops common to the area generally is not possible.

Unless artificially drained, somewhat poorly drained soils are so wet that crop yields are reduced in most years. Melvin, Waverly, Patton, and Karnak soils, which

Figure 18.—An area of Loring silt loam, 2 to 6 percent slopes, used for double cropping. Soybeans have been planted in wheat stubble.

make up about 47,000 acres of the survey area, are poorly drained.

The design of surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and tile drainage is needed in most areas of poorly drained soils that are used for intensive row cropping. Drains need to be more closely spaced in slowly permeable soils than in more permeable soils. Tile drainage is very slow in McGary soils. Adequate outlets for tile drainage systems are difficult to find in many areas of Melvin and Waverly soils. Open ditch drainage is commonly most effective on Calloway and Weinbach soils, which have fragipans.

In most soils on uplands, natural soil fertility in Union and Webster Counties is medium. Some soils on flood plains, for example, Huntington, Nolin, Newark, and Robinsonville soils, are higher in natural plant nutrients than most upland soils. These soils range from slightly acid to mildly alkaline. Belknap, Collins, and Waverly soils on flood plains range from very strongly acid to medium acid.

Many soils on uplands are very strongly acid in their natural state. If they have never been limed, applications of ground limestone are required to raise the pH level sufficiently for good growth of alfalfa and other crops that grow only on nearly neutral soils. Available phosphorus and potash levels are naturally low in most of these soils. On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that have good tilth are granular and porous.

Most of the soils used for crops in the survey area have a surface layer of silt loam that is light in color and low in content of organic matter. Generally, the structure of such soils is weak, and intense rainfall causes the formation of a crust on the surface. This crust is hard when dry and is nearly impervious to water. Once the crust forms, it reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material can help improve soil structure and reduce crust formation.

On the clayey Karnak soils, tilth is a concern because the soils often stay wet until late in spring. If these soils are wet when plowed, they tend to become very cloddy when dry and good seedbeds are difficult to prepare. Tile drainage can help to improve tilth on such soils.

Field crops suited to the soils and climate of the survey area include many that are not commonly grown. At present, corn, tobacco, and soybeans are the most common row crops. Grain sorghum, sunflowers, navy beans, sugar beets, peanuts, potatoes, and similar crops could be grown. Wheat and barley are the common close-growing crops. Rye, oats, buckwheat, and flax could be grown, and more grass seed could be produced from bromegrass and fescue.

Small acreages of special crops are grown commercially in Union and Webster Counties. These crops include vegetables such as corn and tomatoes, tree fruits such as apples and peaches, strawberries, and nursery plants. In addition, large areas of soils can be used for other special crops, for example, blueberries, grapes, and vegetables not commonly grown.

Vegetables grow well in deep soils that have good natural drainage and that warm up early in spring. In the survey area, Memphis and Wellston soils, which have less than 6 percent slopes and make up about 88,000 acres, are especially suited to vegetable crops. Crops grown on these soils can generally be planted and harvested earlier than crops grown on other soils in the survey area.

Many of the well drained soils are suitable for orchards and nursery plants. However, soils at low elevation where frost is frequent and air drainage is poor generally are poorly suited to early vegetables, small fruits, and orchards.

Latest information and suggestions for special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

In general, soils that are well suited to crops are also well suited to urban development. Data about specific soils in this soil survey can be used in planning future land use patterns. Potential productive capacity in farming should be weighed against soil limitations and potential for nonfarm development.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely

to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (*16*). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system as used in this survey area, soils are generally grouped at two levels: capability class and subclass. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Charles A. Foster, staff forester, Soil Conservation Service, assisted in preparing this section.

Union and Webster Counties are in the western Mesophytic forest region. Woodland occupies about 38,000 acres in Union County and 68,900 acres in Webster County. Oak-hickory is the predominant forest type. Three sawmills in Webster County produce rough lumber, cants, crossties, and crating for commercial use from such hardwoods as ash, beech, cottonwood, elm, hickory, red oak, white oak, and sycamore.

Woodland in the survey area is mostly in small private holdings of about 24 acres. Most woodland tracts have the capability of producing 50 cubic feet or more of wood per acre per year, but actual growth is more likely to be about 33 cubic feet. For about 31 percent of the landowners, the woodland happens to be part of the farm and is essentially unmanaged. The tracts are not stocked with desirable, high quality trees. In addition, about 27 percent of woodland areas stay under one ownership for less than 10 years.

If this woodland is properly managed, growth, stocking, and tree quality can be improved. Culling is needed to improve stocking. This soil survey can provide useful soil interpretations to facilitate the management of woodland.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high

productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. It is determined at age 30 for eastern cottonwood, age 35 for American sycamore, and at age 50 for all other species. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability (*4, 5, 6, 8, 11, 17*).

Trees to plant are those that are suited to the soils and to commercial wood production.

recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or

stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

The wildlife population in Union and Webster Counties consists of about 42 species of mammals, 45 species of reptiles and amphibians, and 117 species of birds that nest in the area. In addition, many of the more than 200 other kinds of birds that visit Kentucky each year can probably be found in these counties in season.

Wildlife that are hunted or trapped in the survey area include cottontail rabbits, gray squirrels, fox squirrels, white-tailed deer, red foxes, raccoons, mink, muskrats, bobwhite quail, mourning doves, woodcocks, and several kinds of ducks and geese. Birdwatching and wildlife photography have become increasingly important wildlife activities.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife (*1*). This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, soybeans, ragweed, and foxtail.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of domestic perennial grasses and legumes are Kentucky bluegrass, orchardgrass, white clover, and red clover.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, aster, broomsedge, tick clover, wild carrot, and cinquefoil.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of hardwood trees are white oak, black oak, shagbark hickory, white ash, yellow-poplar, black walnut, black locust, and beech.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. An example of a coniferous tree is eastern redcedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites.

Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, cattail, log rush, spatterdock, and sweetflag.

Shallow water areas have an average depth of less than 5 feet. Some areas are naturally wet, such as marshes and swamps. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, cottontails, red foxes, and mourning doves.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include squirrels, red foxes, raccoons, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, muskrats, and mink.

engineering

William D. Thomas, civil engineer, Soil Conservation Service, assisted in preparing this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section (*2, 3*).

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction

costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability (*14*), a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and

observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated *fair, poor,* or *unsuited* as a source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a good source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. The soils in this survey area are rated fair, poor, or unsuited. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and

depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 17.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*3*) and the system adopted by the American Association of State Highway and Transportation Officials (*2*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 14.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare,

common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

engineering index test data

Table 17 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and their morphology." The soil samples were tested by the Division of Research, Bureau of Highways, Department of Transportation, Commonwealth of Kentucky.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145-73; Unified classification—D 2487-69T; Grain size distribution (mechanical analysis—T 88-72); liquid limit—T 89-68; plasticity index—T 90-70; moisture density, Method A—T 99-74; California bearing ratio—T D-1883.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*19*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements (*7, 12*). In table 18, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquents (*Hapl*, meaning minimal horizonation, plus *aquent*, the suborder of the Entisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Haplaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*15*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*19*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Ashton series

The Ashton series consists of deep, well-drained soils. These soils formed in mixed alluvium on stream terraces. Permeability is moderate. Slope is 0 to 2 percent.

Ashton soils are similar to Wheeling soils and are commonly adjacent to Wheeling, Huntington, and Nolin soils. Wheeling soils do not have an A horizon with color values of a mollic epipedon, are more acid, and have more sand in the control section than Ashton soils. Huntington soils are on flood plains, have a mollic epipedon more than 10 inches thick, and do not have an argillic horizon. Nolin soils are also on flood plains. They do not have an argillic horizon.

Typical pedon of Ashton silt loam, in Union County; 100 feet south of gravel road, at a point that is 0.75 mile east of the Ohio river and 1.25 miles south of Towhead Island; about 4 miles northeast of Uniontown:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; friable; slightly acid; clear smooth boundary.
B21t—9 to 18 inches; brown (7.5YR 4/4) silt loam; moderate fine and medium subangular blocky structure; firm; few fine roots; thin patchy clay films of dark grayish brown (10YR 4/2); medium acid; clear smooth boundary.
B22t—18 to 43 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and coarse subangular blocky structure; firm; few fine roots; thin patchy clay films of dark grayish brown (10YR 4/2); medium acid; gradual smooth boundary.
B23t—43 to 52 inches; brown (7.5YR 4/4) silty clay loam; weak coarse subangular blocky structure; firm; thin patchy clay films of brown (10YR 4/3); few small pockets of grayish brown (10YR 5/2) clay; medium acid; gradual smooth boundary.
B24t—52 to 58 inches; brown (7.5YR 4/4) silt loam; few fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; thin patchy clay films of dark brown (10YR 3/3); medium acid; clear smooth boundary.
IIC—58 to 64 inches; brown (10YR 4/3) fine sandy loam; friable; massive; few clayflows in old root channels of light grayish brown (10YR 6/2); medium acid.

Depth to bedrock is more than 60 inches. Thickness of loamy alluvium over coarser material ranges from 42 to 60 inches and corresponds with thickness of the solum. Reaction of the solum ranges from medium acid to neutral.

The Ap horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The B2 horizon has hue of 7.5YR, value of 4, and chroma of 3 or 4. It is silt loam or silty clay loam. The C horizon is similar in color to the B horizon except that the hue of 10YR is included. It ranges from loam to fine sandy loam or fine sand.

Belknap series

The Belknap series consists of deep, somewhat poorly drained soils on flood plains. These soils formed in loamy alluvium. Permeability is moderate to moderately slow. Slope is 0 to 2 percent.

Belknap soils are similar to Wakeland soils and are commonly adjacent to Collins and Waverly soils. Wakeland soils are not acid in the control section. Collins soils are moderately well drained. Waverly soils are poorly drained.

Typical pedon of Belknap silt loam, in Webster County; 50 feet east of a farm road, at a point that is 0.6 mile south of Kentucky Highway 270 and 0.9 mile west of its intersection with U.S. Highway 41A; about 5 miles south of Dixon:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; few fine roots; medium acid; clear smooth boundary.
C1—9 to 15 inches; brown (10YR 5/3) silt loam; common fine distinct light gray (10YR 6/1) and few fine distinct yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; few fine roots; few fine brown concretions; very strongly acid; gradual smooth boundary.
C2g—15 to 31 inches; light gray (10YR 6/1) silt loam; many fine distinct pale brown (10YR 6/3) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; few fine brown concretions; very strongly acid; gradual smooth boundary.
C3g—31 to 44 inches; gray (10YR 6/1) silt loam; many coarse distinct pale brown (10YR 6/3) and few fine distinct yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; very strongly acid; clear smooth boundary.
C4g—44 to 60 inches; mottled light gray (10YR 7/1, 6/1), pale brown (10YR 6/3), and yellowish brown (10YR 5/6) silt loam; massive; firm; very strongly acid.

Depth to bedrock is more than 5 feet. Reaction of the control section ranges from very strongly acid to strongly acid. Texture is silt or silt loam throughout the profile.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. The C1 horizon has matrix hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The C2g horizon has matrix hue of 10YR, value of 4 through 6, and chroma of 1 or 2. The C3g horizon is similar in color to the C2g horizon. The entire C horizon has mottles in shades of gray and brown.

Calloway series

The Calloway series consists of deep, somewhat poorly drained soils on uplands. These soils formed in loess. Permeability is slow. Slope is 0 to 2 percent.

Calloway soils are similar to Weinbach soils and are commonly adjacent to Grenada, Loring, and Belknap soils. Weinbach soils developed in mixed alluvium on stream terraces and do not have an A'2 horizon. Loring and Grenada soils are browner and less gray in the B horizon than Calloway soils. Belknap soils are on flood plains and do not have a fragipan.

Typical pedon of Calloway silt loam, in Webster County; 400 feet south of U.S. Highway 41A and 1.25 miles northeast of the intersection with Kentucky Highway 120; about 2 miles northeast of Providence:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; very friable; few

fine roots; few small dark brown concretions; mildly alkaline; clear smooth boundary.
B2—9 to 18 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; friable; few fine roots; few small black concretions; very strongly acid; gradual smooth boundary.
A'2—18 to 21 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very friable; few fine roots; few fine pores; very strongly acid; gradual irregular boundary.
B'x1—21 to 30 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct light gray (10YR 6/1, 7/2) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky structure; very firm, brittle, and compact; few fine roots between prisms; thin patchy clay films on peds and in pores; light brownish gray (10YR 6/2) silt coatings on faces of prisms; few fine yellowish brown concretions; strongly acid; gradual smooth boundary.
B'x2—30 to 61 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light gray (10YR 7/2) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots between prisms; thin patchy clay films on peds; few fine yellowish brown concretions; strongly acid; gradual smooth boundary.

Thickness of the solum is more than 60 inches. Depth to the fragipan ranges from 18 to 30 inches. Depth to bedrock is more than 5 feet. Unless the soil is limed, reaction ranges from strongly acid to very strongly acid to a depth of 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B2 horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 4 or 6. Mottles are in shades of gray. Texture is silt loam or silty clay loam. The A'2 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 3. It is silt or silt loam. The B'x horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 2 through 6. Mottles are few to many and in shades of brown, gray, or yellow. Texture is silt loam or silty clay loam.

Collins series

The Collins series consists of deep, moderately well drained soils on flood plains. These soils formed in loamy alluvium. Permeability is moderate. Slope is 0 to 2 percent.

Collins soils are similar to Wilbur and Lindside soils and are commonly adjacent to Frondorf, Belknap, and Waverly soils. Wilbur and Lindside soils are not acid in the control section. Lindside soils have a fine-silty control section. Frondorf soils have an argillic horizon and are on uplands. Belknap and Waverly soils are grayer in the control section.

Typical pedon of Collins silt loam, in Webster County; 60 feet west of farm road, at a point that is 0.75 mile north of Kentucky Highway 138 and 1 mile west of the crossing at Deer Creek; about 4 miles east of Dixon:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; few fine roots; medium acid; clear smooth boundary.
C1—9 to 15 inches; brown (10YR 5/3) silt loam; few fine faint pale brown (10YR 6/3) mottles; weak fine subangular blocky structure; friable; few fine roots; very strongly acid; gradual smooth boundary.
C2—15 to 24 inches; brown (10YR 5/3) silt loam; common fine faint pale brown (10YR 6/3) and few fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few fine black concretions; very strongly acid; gradual smooth boundary.
C3—24 to 35 inches; pale brown (10YR 6/3) silt loam; common fine distinct light brownish gray (10YR 6/2) and brown (10YR 5/3) and few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; very friable; few fine black concretions; very strongly acid; gradual smooth boundary.
C4—35 to 48 inches; pale brown (10YR 6/3) silt loam; many fine faint light brownish gray (10YR 6/2) and few fine faint brown (10YR 5/3) mottles; weak fine subangular blocky structure; friable; very strongly acid; gradual smooth boundary.
C5—48 to 60 inches; light gray (10YR 6/1) silt loam; common fine distinct yellowish brown (10YR 5/6), few fine faint light brownish gray (10YR 6/2), and few fine distinct brown (10YR 5/3) mottles; massive; firm; few fine black concretions; very strongly acid.

Unless the soil is limed, reaction ranges from very strongly acid to strongly acid. Depth to bedrock is more than 5 feet. Thin bedding planes are evident in most pedons in the C1 horizon.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The C horizon has hue of 10YR or 2.5Y, value of 4 through 7, and chroma of 1 through 3. Gray mottles occur below a depth of 15 inches. Texture is silt loam or silt.

Frondorf series

The Frondorf series consists of moderately deep, well drained soils on uplands. These soils formed in loess and the underlying residuum of sandstone and shale. Permeability is moderate. Slope ranges from 20 to 30 percent.

Frondorf soils are similar to Wellston soils and are commonly adjacent to Memphis, Loring, and Collins soils. Wellston and Memphis soils are more than 40

inches deep to bedrock and have a fine-silty control section. Loring soils have a fragipan. Collins soils are deep. They are on flood plains and have a coarse-silty control section.

Typical pedon of Frondorf silt loam, 20 to 30 percent slopes, in Webster County; 100 feet east of farm road, at a point that is 0.25 mile north of gravel road and 1.6 miles east of the intersection with U.S. Highway 41A; about 3.5 miles north of Dixon:

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.
A2—3 to 6 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; very friable; common fine roots; many fine pores; slightly acid; clear smooth boundary.
B1—6 to 10 inches; light yellowish brown (10YR 6/4) silt loam; few fine faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; very strongly acid; clear smooth boundary.
B21t—10 to 14 inches; light yellowish brown (10YR 6/4) silt loam; common medium faint yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; few fine roots; very strongly acid; gradual smooth boundary.
IIB22t—14 to 25 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous brown (7.5YR 4/4) clay films; few black stains on ped faces; some peds coated with silt; 10 percent sandstone fragments 1 to 6 inches in diameter; very strongly acid; clear smooth boundary.
IIC—25 to 28 inches; yellowish brown (10YR 5/6) channery silty clay loam; massive; very firm; few fine roots; many fine pores; brown thin patchy clay films in cracks (7.5YR 4/4); 30 percent coarse fragments; very strongly acid.
IIR—28 inches; sandstone.

Thickness of the solum and depth to bedrock ranges from 20 to 40 inches. Unless the soil is limed, reaction ranges from strongly acid to very strongly acid.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 and Ap horizons have hue of 10YR, value of 5 or 6, and chroma of 2 through 4. Content of coarse fragments is less than 5 percent. The B horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 4 or 6. Texture is silt loam or silty clay loam. Content of coarse fragments is less than 15 percent. The C horizon is similar in color to the B horizon. Texture is channery silty clay loam, channery silty clay, or channery sandy clay loam. Content of coarse fragments ranges from 15 to 40 percent.

Grenada series

The Grenada series consists of deep, moderately well drained soils on uplands. These soils formed in loess. Permeability is slow. Slope ranges from 2 to 6 percent.

Grenada soils are similar to Otwell soils and are commonly adjacent to Loring, Calloway, and Belknap soils. Otwell soils are on terraces at a lower elevation than Grenada soils. They developed in mixed alluvium and do not have an A'2 horizon. Loring soils are at a higher elevation and do not have an A'2 horizon. Calloway soils are nearly level and are grayer in the subsoil than Grenada soils. Slopes are often concave. Belknap soils are on flood plains and do not have a fragipan.

Typical pedon of Grenada silt loam, 2 to 6 percent slopes, in Webster County; 300 feet west of U.S. Highway 41A and 0.1 mile north of the intersection with Kentucky Highway 120; about 0.5 mile northeast of Providence:

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; strongly acid; clear smooth boundary.
B21—6 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; common fine faint brown (10YR 4/3) mottles; weak very fine and fine subangular blocky structure; friable; common fine roots; very strongly acid; gradual smooth boundary.
B22—12 to 22 inches; yellowish brown (10YR 5/6) silt loam; few fine distinct pale brown (10YR 6/3) mottles in lower part; moderate fine and medium subangular blocky structure; firm; few fine roots; few small black concretions; strongly acid; abrupt wavy boundary.
A'2—22 to 24 inches; light gray (10YR 7/2) silt loam; common fine distinct yellowish brown (10YR 5/4, 5/6) mottles; weak fine subangular blocky structure; friable; many fine vesicular pores; strongly acid; abrupt wavy boundary.
B'x1—24 to 33 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct brownish yellow (10YR 6/6) and coarse medium distinct light gray (10YR 7/2) mottles; moderate very coarse prismatic structure parting to very fine, fine, and medium subangular blocky; firm; compact and brittle; few fine roots in cracks; thin continuous clay films of brown (7.5YR 4/4) on peds; light gray (10YR 7/2) vertical streaks; strongly acid; gradual smooth boundary.
B'x2—33 to 48 inches; dark yellowish brown (10YR 4/4) silt loam; moderate very coarse prismatic structure parting to very fine, fine, and medium subangular blocky; firm, compact, and brittle; thin patchy clay films; light brownish gray (10YR 6/2) vertical streaks of silty clay loam; strongly acid; gradual smooth boundary.
Cx—48 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; common fine distinct gray (10YR 6/1)

mottles; massive; firm, compact, and brittle; black and gray coats in pores and cracks; strongly acid.

Thickness of the solum ranges from 33 to 60 inches. Unless the soil is limed, reaction ranges from strongly acid to very strongly acid to a depth of 60 inches. Depth to bedrock is more than 5 feet. Depth to a fragipan ranges from 20 to 30 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. The B horizon above the fragipan has hue of 10YR, value of 4 through 6, and chroma of 4 through 6. The A'2 horizon has hue of 10YR, value of 5 through 7, and chroma of 1 or 2. Texture is silt or silt loam. The B'x horizon has hue of 10YR, value of 4 or 5, and chroma of 3 through 6. Mottles are in shades of gray, brown, or yellow. Texture of the Bx horizon is silt loam or silty clay loam.

Haymond series

The Haymond series consists of deep, well drained soils on flood plains. These soils formed in loamy alluvium. Permeability is moderate. Slope is 0 to 2 percent.

Haymond soils are similar to Wilbur soils and are commonly adjacent to Memphis, Wilbur, and Wakeland soils. Memphis soils are on upland ridges and side slopes and have a fine-silty control section. Wilbur and Wakeland soils are on flood plains and have more low chroma in the control section.

Typical pedon of Haymond silt loam, in Union County; 100 feet north of Cypress Creek, 200 feet west of Kentucky Highway 95, 0.5 mile southeast of the intersection with Kentucky Highway 365; about 0.75 mile south of Sturgis:

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; few fine roots; neutral; clear smooth boundary.

C1—9 to 26 inches; dark brown (10YR 4/3) silt loam; few fine faint brown (10YR 5/3) mottles; weak fine granular structure; friable; thin bedding planes; neutral; gradual smooth boundary.

C2—26 to 50 inches; dark brown (10YR 4/3) silt loam; few fine faint dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) mottles; massive; thin bedding planes; friable; neutral; gradual smooth boundary.

C3—50 to 60 inches; brown (10YR 5/3) silt loam; few fine faint dark yellowish brown (10YR 4/4) mottles; massive; thin bedding planes; friable; neutral.

Depth to bedrock is more than 5 feet. Reaction is slightly acid or neutral throughout the profile. Bedding planes are evident in all horizons below the Ap horizon. Texture is silt or silt loam throughout.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Low chroma mottles are in some pedons below a depth of 40 inches.

Henshaw series

The Henshaw series consists of deep, somewhat poorly drained soils on stream terraces. These soils formed in loamy alluvium. Permeability is moderately slow. Slope is 0 to 2 percent.

Henshaw soils are similar to Wakeland soils and are commonly adjacent to Uniontown, Patton, and Wakeland soils. Wakeland soils are on flood plains and do not have an argillic horizon. Uniontown soils are less gray in the upper part of the B horizon than Henshaw soils. Patton soils are at a slightly lower elevation and have a mollic epipedon.

Typical pedon of Henshaw silt loam, in Union County; 0.5 mile east of Kentucky Highway 359 and 0.7 mile south of the intersection with Kentucky Highway 141; about 2 miles northeast of Morganfield:

Ap—0 to 8 inches; brown (10YR 5/3) silt loam; few fine faint grayish brown (10YR 5/2) mottles; weak fine granular structure; friable; few small black concretions; common fine roots; medium acid; clear smooth boundary.

A2—8 to 12 inches; brown (10YR 5/3) silt loam; common fine faint pale brown (10YR 6/3) mottles; weak fine granular structure; friable; few small black concretions; common fine roots; slightly acid; abrupt smooth boundary.

B1—12 to 17 inches; pale brown (10YR 6/3) silt loam; few fine distinct yellowish brown (10YR 5/4) and few medium faint light brownish gray (10YR 6/2) mottles; weak and moderate medium angular blocky structure; peds coated with light gray (10YR 7/2) silt; firm; few small black and brown concretions; few fine roots; strongly acid; gradual smooth boundary.

B21t—17 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; moderate fine and medium angular blocky structure; firm; peds thinly coated with light gray (10YR 7/2) silt; few thin patchy clay films; few small black concretions; few fine roots; strongly acid; clear smooth boundary.

B22t—22 to 30 inches; olive brown (2.5Y 4/4) silty clay loam; few fine distinct light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) mottles; strong medium and coarse angular blocky structure; very firm; thin continuous clay films; few small concretions; few fine roots; strongly acid; clear smooth boundary.

B23t—30 to 44 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; weak fine angular blocky structure; firm; thin patchy clay films; few small black concretions; slightly acid; clear smooth boundary.

Cg—44 to 60 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; massive; friable; few small black concretions; mildly alkaline; weakly calcareous below a depth of 55 inches.

Thickness of the solum ranges from 40 to 55 inches. Depth to bedrock is more than 10 feet. Depth to carbonates ranges from 44 to 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B1 and B2 horizons have hue of 2.5Y or 10YR, value of 4 through 6, and chroma of 3 through 6. Mottles in chroma of 2 or less are few to many. Texture is silt loam or silty clay loam. Reaction ranges from slightly acid through strongly acid. The C horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 2 through 4. Mottles are in shades of brown and gray. Reaction ranges from neutral through moderately alkaline. Texture is silt loam or silty clay loam.

Huntington series

The Huntington series consists of deep, well drained soils on flood plains that formed in mixed alluvium. Permeability is moderate. Slope is 0 to 2 percent.

Huntington soils are similar to Nolin soils and are commonly adjacent to Robinsonville, Lindside, and Nolin soils. Nolin soils do not have a mollic epipedon. Lindside soils are on the flood plain with Huntington soils but are grayer in the control section. Robinsonville soils have a coarse-loamy control section.

Typical pedon of Huntington silt loam, in Union County; at a point that is 1.25 miles south of Towhead Island, 300 feet east of the Ohio River, and 100 feet west of gravel road; about 3 miles northeast of Uniontown:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; friable; neutral; clear smooth boundary.

B1—9 to 15 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

B21—15 to 27 inches; brown (10YR 4/3) silt loam; weak fine and medium subangular blocky structure; friable; few fine roots; some ped exteriors very dark grayish brown (10YR 3/2); neutral; gradual smooth boundary; few thin pockets of very fine sand.

B22—27 to 42 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

C—42 to 60 inches; brown (10YR 4/3) silt loam; massive; firm; neutral; few thin pockets of very fine sand.

Thickness of the solum ranges from 40 to 60 inches. Thickness of the mollic epipedon ranges from 10 to 20 inches. Reaction ranges from slightly acid to mildly alkaline.

The Ap and B1 horizons have hue of 10YR, value of 3, and chroma of 2 or 3. Texture is dominantly silt loam but ranges to silty clay loam. The B21 horizon has hue of 10YR, value of 4, and chroma of 3 or 4. Some peds have a coating in hue of 10YR, value of 3, and chroma of 2. Texture is silt loam or silty clay loam. The C horizon is similar in color to the B horizon. Texture of the C horizon is silt loam, loam, or fine sandy loam.

Karnak series

The Karnak series consists of deep, poorly drained soils on wide flood plains. These soils formed in slack-water alluvium. Permeability is very slow or slow. Slope is 0 to 2 percent.

Karnak soils are similar to McGary soils and are commonly adjacent to McGary, Belknap, and Weinbach soils. McGary soils are on terraces. They are less grayish than Karnak soils and do not have vertic properties. Weinbach soils are on stream terraces and have a fragipan. Belknap soils are on flood plains with Karnak soils but have a coarse-silty control section.

Typical pedon of Karnak silty clay, in Webster County; 0.25 mile north of Crab Orchard Creek and 1 mile east of Kentucky Highway 132 at the crossing of Crab Orchard Creek; about 1.5 miles southwest of Clay:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silty clay; moderate fine and medium granular structure; firm; common fine roots; few fine black concretions; medium acid; clear smooth boundary.

B21g—9 to 13 inches; dark grayish brown (10YR 4/2) silty clay; common fine faint dark yellowish brown (10YR 4/4) mottles in ped interiors and dark gray (10YR 4/1) on ped exteriors; moderate medium subangular blocky structure; firm; few fine roots; slightly acid; gradual smooth boundary.

B22g—13 to 25 inches; dark gray (10YR 4/1) silty clay; many fine distinct dark yellowish brown (10YR 4/4) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; few fine black concretions; slightly acid; gradual smooth boundary.

B23g—25 to 40 inches; gray (10YR 5/1) silty clay; many fine distinct dark yellowish brown (10YR 4/4) and few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; few fine roots; few fine black concretions; mildly alkaline; gradual smooth boundary.

Cg—40 to 60 inches; gray (10YR 5/1) silty clay; many fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; few fine black concretions; mildly alkaline.

The solum ranges from 30 to 54 inches in thickness. Reaction is medium acid to mildly alkaline in the solum. Depth to bedrock is more than 5 feet.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. Texture ranges from silty clay to silt loam. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. Mottles are of higher chroma, and some mottles have hue of 7.5YR. Texture is silty clay or clay. The C horizon has color and texture similar to the B horizon.

In this survey area, these Karnack soils have a higher reaction in the subsoil than is allowed in the series and are considered taxadjuncts to the Karnack series. This difference does not affect the use and management.

Lindside series

The Lindside series consists of deep, moderately well drained soils that formed in mixed alluvium. Permeability is moderate to moderately slow. Slope is 0 to 2 percent.

Lindside soils are similar to Newark soils and are commonly adjacent to Huntington, Nolin, and Newark soils. Huntington and Newark soils are on adjacent flood plains. Huntington soils have a mollic epipedon, and Newark soils have more low chroma in the control section than Lindside soils. Nolin soils are on flood plains and have a less grayish subsoil.

Typical pedon of Lindside silty clay loam, in Union County; 200 feet north of Kentucky Highway 667 and 3 miles south of the intersection with Kentucky Highway 668; about 1.5 miles west of De Koven:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silty clay loam; weak fine granular structure; very friable; few fine roots; neutral; clear smooth boundary.

B1—10 to 16 inches; brown (10YR 4/3) silty clay loam; weak very fine subangular blocky structure; friable; few fine roots; slightly acid; gradual smooth boundary.

B2—16 to 29 inches; brown (10YR 4/3) silty clay loam; few fine faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few fine roots; slightly acid; gradual smooth boundary.

B3—29 to 46 inches; brown (10YR 5/3) silty clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak very fine and fine subangular blocky structure; friable; very few roots; slightly acid; gradual smooth boundary.

C—46 to 60 inches; brown (10YR 5/3) silty clay loam; common medium distinct gray (10YR 5/1) mottles; massive; slightly acid.

Thickness of the solum ranges from 30 to 50 inches. Unless the soil is limed, reaction ranges from medium acid to slightly acid. Depth to bedrock is more than 5 feet.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Mottles are in shades of gray and brown. Texture ranges from silty clay loam to silt loam. The C horizon is similar in color to the B horizon. Texture ranges from silty clay loam to silt loam and loam.

Loring series

The Loring series consists of deep, moderately well drained soils on uplands. These soils formed in loess. Permeability is moderately slow. Slope is 2 to 12 percent.

Loring soils are similar to Zanesville soils and are commonly adjacent to Memphis, Frondorf, and Grenada soils. The lower part of the profile of Zanesville soils formed in residuum from sandstone, siltstone, and shale. Memphis soils do not have a fragipan and are on higher-lying, convex ridges and side slopes. Frondorf soils are on adjacent lower-lying side slopes, do not have a fragipan, and are less than 40 inches deep to bedrock. Grenada soils have an A'2 horizon and are on lower-lying convex ridges and side slopes.

Typical pedon of Loring silt loam, 2 to 6 percent slopes, in Webster County; 100 feet north of Kentucky Highway 1405, at a point that is 0.2 mile southeast of the intersection with Kentucky Highway 1835; about 3 miles north of Slaughters:

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; very strongly acid; clear smooth boundary.

B21t—7 to 21 inches; brown (7.5YR 4/4) silty clay loam; strong fine and medium subangular blocky structure; firm; few fine roots; thin continuous clay films; very strongly acid; gradual smooth boundary.

B22t—21 to 31 inches; brown (7.5YR 4/4) silt loam; strong brown (7.5YR 5/6) ped interiors; moderate fine and medium angular blocky structure; friable; thin patchy clay films on ped surfaces and in pores; some peds coated with pale brown (10YR 6/3) silt; few small dark brown concretions; very strongly acid; clear smooth boundary.

Bx1—31 to 42 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; weak very coarse prismatic structure parting to strong coarse angular blocky; firm, compact, and brittle; thin patchy clay films on some peds; cracks filled with gray (10YR 6/1) and pale brown (10YR 6/3) silt; very strongly acid; gradual smooth boundary.

Bx2—42 to 50 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct light brownish gray (10YR 6/2) and faint yellowish brown (10YR 5/6) mottles; weak very coarse prismatic structure parting to weak medium subangular blocky; very firm, compact, and brittle; pores coated with black and brown concretionary material; few small black concretions; very strongly acid.

C—50 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; few fine faint yellowish brown (10YR 5/6) and

few fine distinct light brownish gray (10YR 6/2) mottles; massive; firm; few pores; very strongly acid.

Thickness of the solum ranges from 45 to 60 inches. Depth to the fragipan ranges from 24 to 35 inches. Unless the soil is limed, reaction is strongly acid to very strongly acid throughout the profile. Depth to bedrock is more than 5 feet.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The B horizon above the fragipan has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 6. The Bx horizons are similar in color to the upper part of the B horizon and have mottles in shades of gray, brown, and yellow. The C horizon is similar in color to the Bx horizon.

Markland series

The Markland series consists of deep, well drained to moderately well drained soils on stream terraces. These soils formed in clayey alluvium. Permeability is slow. Slope ranges from 6 to 30 percent.

Markland soils are similar to McGary soils and are commonly adjacent to Karnak, McGary, and Collins soils. McGary soils are on adjacent terraces and have chroma of less than 2 in the upper part of the B horizon. Karnak and Collins soils are on flood plains. Karnak soils have vertic properties and are grayish. Collins soils have a coarse-silty control section.

Typical pedon of Markland silt loam, from an area of Markland-Collins complex, in Webster County; 0.2 mile west of Kentucky Highway 147 and 2 miles northwest of the intersection with Kentucky Highway 370; about 2 miles northwest of Onton:

O1—1 to 0 inches; partly decomposed leaves and twigs from hardwoods.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; strongly acid; clear smooth boundary.

B21t—5 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin patchy clay films; strongly acid; gradual smooth boundary.

B22t—14 to 32 inches; yellowish brown (10YR 5/4) silty clay; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm; thin continuous clay films; strongly acid; gradual smooth boundary.

B3—32 to 44 inches; yellowish brown (10YR 5/4) silty clay; moderate medium subangular blocky structure; very firm; moderately alkaline; gradual smooth boundary.

C—44 to 60 inches; yellowish brown (10YR 5/4) clay; common fine distinct mottles of dark yellowish brown (10YR 4/4) and light brownish gray (10YR 6/2); massive; very firm; moderately alkaline.

Thickness of the solum ranges from 24 to 44 inches. Depth to bedrock is more than 5 feet. Reaction ranges from strongly acid to moderately alkaline in the solum.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. Texture is silt loam or silty clay loam. The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. The C horizon is mottled in shades of gray, brown, and yellow. Texture of the B and C horizons is silty clay loam, silty clay, or clay.

McGary series

The McGary series consists of deep, somewhat poorly drained soils on stream terraces. These soils formed in clayey alluvium. Permeability is slow to very slow. Slope is 0 to 2 percent.

McGary soils are similar to Karnak soils and are commonly adjacent to Karnak, Collins, and Belknap soils. Karnak soils are on low-lying flood plains and have vertic properties. Collins and Belknap soils are on flood plains of smaller streams and have a coarse-silty control section.

Typical pedon of McGary silt loam, in Webster County; 200 feet northwest of Kentucky Highway 495 and .025 mile north of the crossing at East Fork Deer Creek; about 4 miles south of Sebree:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; common fine roots; very strongly acid; abrupt smooth boundary.

A2—3 to 6 inches; light brownish gray (10YR 6/2) silt loam; common fine faint pale brown (10YR 6/3) mottles; weak fine granular structure; friable; common fine roots; very strongly acid; abrupt smooth boundary.

B1—6 to 10 inches; light brownish gray (2.5Y 6/2) silty clay loam; many medium distinct brownish yellow (10YR 6/6) mottles; weak fine subangular blocky structure; firm; common fine roots; very strongly acid; clear smooth boundary.

B21t—10 to 16 inches; yellowish brown (10YR 5/4) silty clay; many common distinct gray (10YR 6/1) mottles; moderate medium subangular blocky structure; very firm; thin patchy clay films on faces of peds; few fine roots; strongly acid; clear smooth boundary.

B22t—16 to 27 inches; dark yellowish brown (10YR 4/4) clay; common medium and coarse gray (10YR 6/1) mottles; moderate coarse prismatic structure parting to moderate coarse subangular blocky; very firm; thin patchy clay films on faces of peds; few fine and medium roots; strongly acid; gradual smooth boundary.

B23t—27 to 41 inches; yellowish brown (10YR 5/4) clay; common medium distinct gray (10YR 6/1) mottles; moderate coarse prismatic structure parting to moderate coarse subangular blocky; very firm; thin

patchy clay films on faces of peds; few medium roots; very strongly acid; clear smooth boundary.
C1—41 to 60 inches; grayish brown (2.5Y 5/2) clay; common medium distinct light olive brown (2.5Y 5/4) and few fine distinct yellowish brown (10YR 5/6) mottles; massive; very firm; few fine roots; neutral.

Thickness of the solum ranges from 30 to 50 inches. Depth to bedrock is more than 5 feet. Unless the soil is limed, reaction of the solum is medium acid to very strongly acid.

The Ap and A1 horizons have hue of 10YR, value of 4 or 5, and chroma of 2 or 3. If present, the A2 horizon is 1 to 3 inches thick and has hue of 10YR, value of 5 or 6, and chroma of 2. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 or 6. Mottles of low chroma are throughout this horizon. Texture is silty clay loam, silty clay, or clay. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 through 4. Texture is silty clay or clay.

These McGary soils have a browner B horizon and carbonates at slightly greater depth than is allowed in the range of the series and are considered taxadjuncts to the McGary series. This difference does not significantly affect their use and management.

Melvin series

The Melvin series consists of deep, poorly drained soils on flood plains. These soils formed in mixed alluvium. Permeability is moderate. Slope is 0 to 2 percent.

Melvin soils are similar to Waverly soils and are commonly adjacent to Newark, Lindside, and Nolin soils. Waverly soils are on flood plains. They have an acid, coarse-silty control section. Newark, Lindside, and Nolin soils, which are on adjacent flood plains, have a less grayish control section than Melvin soils.

Typical pedon of Melvin silty clay loam, in Union County; 400 feet west of gravel road and 1.5 miles north of Kentucky Highway 360; about 3 miles east of Uniontown:

A11—0 to 2 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.
A12—2 to 9 inches; gray (10YR 5/1) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; weak fine subangular blocky structure; firm; common fine roots; medium acid; gradual smooth boundary.
B21g—9 to 15 inches; gray (10YR 5/1) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and brown (10YR 4/3) mottles; weak fine subangular blocky structure; firm; common fine roots; medium acid; gradual smooth boundary.
B22g—15 to 31 inches; gray (10YR 5/1) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and brown (10YR 4/3) mottles; weak coarse subangular blocky structure; very firm; few fine roots; medium acid; gradual smooth boundary.
B3g—31 to 38 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; very weak subangular blocky structure; very firm; few fine roots; few fine black concretions; slightly acid; clear smooth boundary.
Cg—38 to 60 inches; gray (10YR 6/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and few fine faint light gray (10YR 7/1) mottles; massive; very firm; slightly acid.

Thickness of solum ranges from 20 to 40 inches. Depth to bedrock is more than 5 feet. Reaction of the solum ranges from medium acid to neutral.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 1 through 3. The Bg horizon has hue of 10YR, value of 4 through 6, and chroma of 1 or 2. Mottles are in shades of brown and yellow. Texture is silty clay loam or silt loam. The matrix color of the C horizon is similar to that of the B horizons. Mottles are in shades of brown and gray. Texture is silty clay loam or silt loam.

Memphis series

The Memphis series consists of deep, well drained soils on uplands. These soils formed in loess. Permeability is moderate. Slope ranges from 2 to 30 percent.

Memphis soils are similar to Uniontown and Wellston soils and are commonly adjacent to Loring, Uniontown, Wellston, and Wilbur soils. Wellston soils are on upland side slopes. They developed in loess less than 48 inches thick over residuum from sandstone and shale. Loring soils have a fragipan. Wilbur soils are on flood plains and have a coarse-silty control section. They do not have an argillic horizon. The moderately well drained to well drained Uniontown soils formed in alluvium.

Typical pedon of Memphis silt loam, in an area of Memphis silt loam, 2 to 6 percent slopes, in Union County; 200 feet northwest of U.S. Highway 60, at a point that is 2 miles northeast of the intersection with Kentucky Highway 492; about 1 mile southwest of Morganfield:

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; few fine faint yellowish brown (10YR 5/4) mottles; weak fine granular structure; very friable; many fine roots; medium acid; abrupt smooth boundary.
B1—6 to 13 inches; yellowish brown (10YR 5/4) silt loam; common medium faint brown (10YR 5/3) mottles; moderate fine angular blocky structure; friable; many fine roots; few dark stains on some ped faces; medium acid; gradual smooth boundary.

B21t—13 to 17 inches; brown (7.5YR 4/4) silty clay loam; moderate fine and medium angular blocky structure; very firm; thin continuous clay films; few dark stains on some ped faces; very strongly acid; gradual smooth boundary.
B22t—17 to 28 inches; dark brown (7.5YR 4/4) silty clay loam; moderate fine and medium angular blocky structure; very firm; continuous clay films; many fine roots; few dark stains on some ped faces; very strongly acid; gradual smooth boundary.
B23t—28 to 43 inches; dark brown (7.5YR 4/4) silty clay loam; few fine distinct pale brown (10YR 6/3) mottles; moderate coarse angular blocky structure; firm; thin continuous clay films; few dark stains on some ped faces; very strongly acid; gradual smooth boundary.
C—43 to 60 inches; brown (7.5YR 4/4) silt loam; common fine faint strong brown (7.5YR 5/6) and pale brown (10YR 6/3) mottles; massive; friable; few dark stains in old root channels; very strongly acid.

Thickness of the solum ranges from 32 to 50 inches. Depth to bedrock is more than 5 feet. Unless the soil is limed, reaction of the solum ranges from very strongly acid to medium acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is silt loam or silty clay loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is silt loam or silty clay loam. The C horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 4 or 6. Texture is silt or silt loam.

Newark series

The Newark series consists of deep, somewhat poorly drained soils on flood plains. These soils formed in mixed alluvium. Permeability is moderate. Slope 0 to 2 percent.

Newark soils are similar to Wakeland soils and are commonly adjacent to Melvin, Lindside, and Nolin soils. Wakeland soils are on flood plains and have a coarse-silty control section. Melvin soils have a grayer control section than Newark soils. The control section of Lindside and Nolin soils is not so gray.

Typical pedon of Newark silty clay loam, in Union County; 50 feet east of farm road, at a point that is 0.75 mile northeast of Kentucky Highway 360 and 1 mile west of the intersection with Kentucky Highway 359; about 5 miles east of Uniontown:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay loam; weak fine granular structure; firm; few fine roots; medium acid; clear smooth boundary.
B21—8 to 13 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct gray (10YR 6/1), yellowish brown (10YR 5/6), and common fine faint brown (10YR 4/3) mottles; weak coarse subangular blocky structure; firm; medium acid; clear smooth boundary.
B22g—13 to 43 inches; gray (10YR 6/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; medium acid; few fine black concretions; gradual smooth boundary.
Cg—43 to 60 inches; gray (10YR 6/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; few fine dark brown concretions; medium acid.

Thickness of the solum ranges fom 22 to 44 inches. Reaction ranges from medium acid to mildly alkaline.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 through 4. The B21 horizon dominantly has hue of 10YR to 2.5Y, value of 4 or 5, and chroma of 2 through 4 with mottles in shades of brown or gray. Matrix colors of the B22g horizon are in hue of 10YR to 2.5Y, value of 4 through 7, and chroma of 1 or 2 with few to many mottles in shades of brown. Texture is silt loam or silty clay loam. The C horizon is similar to the B22g horizon.

Nolin series

The Nolin series consists of deep, well drained soils on flood plains. These soils formed in mixed alluvium. Permeability is moderate. Slope is 0 to 2 percent.

Nolin soils are similar to Huntington soils and are commonly adjacent to Lindside, Ashton, and Huntington soils. Huntington soils have a mollic epipedon. Lindside soils are grayer in the control section than Nolin soils. Ashton soils are on higher-lying terraces and have an argillic horizon.

Typical pedon of Nolin silty clay loam, in Union County; 0.I mile southeast of Kentucky Highway 667 and 1 mile southwest of the intersection with Kentucky Highway 871; about 3 miles northeast of Shawneetown Bridge:

Ap—0 to 10 inches; brown (10YR 4/3) silty clay loam; weak fine granular structure; friable; many fine roots; very dark grayish brown (10YR 3/2) coatings; mildly alkaline; clear smooth boundary.
B1—10 to 19 inches; brown (10YR 4/3) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; very dark grayish brown (10YR 3/2) coatings; neutral; gradual smooth boundary.
B21—19 to 28 inches; brown (10YR 4/3) silty clay loam; few fine faint brown (10YR 5/3) mottles; moderate coarse angular blocky structure; very firm; few fine roots between peds; neutral; gradual smooth boundary.
B22—28 to 52 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; very firm; neutral; gradual smooth boundary.
C—52 to 60 inches; brown (10YR 4/3) silty clay loam; massive; firm; neutral.

Thickness of the solum ranges from 45 to 60 inches. Depth to bedrock is more than 5 feet. Reaction ranges from medium acid through mildly alkaline.

The Ap has hue of 10YR, value of 4, and chroma of 2 or 3. In some pedons, ped exteriors have coatings of lower value and chroma than ped interiors. The B horizons have hue of 10YR, value of 4, and chroma of 3 or 4. The lower part of the B horizons is frequently mottled in shades of brown and yellow. Texture is silt loam or silty clay loam. Matrix color and texture of the C horizon is similar to that of the B horizons. Mottles of low chroma are in many pedons.

Otwell series

The Otwell series consists of deep, moderately well drained soils on terraces along the Ohio and Green Rivers. These soils formed in loess and the underlying alluvium. Permeability is slow. Slope ranges from 0 to 6 percent.

Otwell soils are similar to Loring soils and are commonly adjacent to Wheeling, Weinback, and Melvin soils. Loring soils formed in loess on uplands. Wheeling soils are on higher lying terraces. They have a fine-loamy control section. Weinbach soils are on adjacent terraces. They have a grayer B horizon than Otwell soils. Melvin soils are on low-lying flood plains and have a grayer control section.

Typical pedon of Otwell silt loam, 0 to 2 percent slopes, in Union County; 100 feet west of gravel road and 0.25 mile south of Goose Pond Ditch, at a point that is 1.5 miles northwest of Kentucky Highway 56 and 2 miles west of intersection with Kentucky Highway 360; about 2.5 miles northwest of Spring Grove:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

B21t—8 to 12 inches; brown (10YR 4/3) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; common fine roots; thin patchy clay films; very strongly acid; gradual smooth boundary.

B22t—12 to 19 inches; yellowish brown (10YR 5/4) silty clay loam, common medium faint yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; few fine roots; thin patchy clay films; very strongly acid; gradual smooth boundary.

B23t—19 to 23 inches; yellowish brown (10YR 5/6) silty clay loam, few fine faint yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular blocky structure; friable; few fine roots; thin patchy clay films; very strongly acid; gradual smooth boundary.

Bx1—23 to 38 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light gray (10YR 7/2) mottles; weak very coarse prismatic structure parting to moderate fine angular blocky; very firm, brittle, and compact; few roots in cracks; few small dark yellowish brown concretions; very strongly acid; gradual smooth boundary.

Bx2—38 to 45 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct light gray (10YR 7/2) mottles; weak very coarse prismatic structure parting to moderate very fine and fine angular blocky; very firm, brittle, and compact; few roots in cracks; very strongly acid; gradual smooth boundary.

C—45 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; massive; firm; few fine roots; strongly acid.

Thickness of the solum ranges from 40 to 60 inches. Depth to bedrock is more than 5 feet. Unless the soil is limed, reaction ranges from medium acid to very strongly acid. Depth to the fragipan ranges from 18 to 28 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 through 6. Mottles of low chroma are in the lower part of some pedons. The Bx horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 or 6. Mottles that have chroma of 2 are few or common. Texture of the B horizon ranges from silt loam to silty clay loam. The C horizon is similar in color to the Bx horizon and has strata of silty clay loam or silty clay.

Patton series

The Patton series consists of deep, poorly drained soils on stream terraces. These soils formed in loamy alluvium. Permeability is moderate. Slope is 0 to 2 percent.

Patton soils are commonly adjacent to Uniontown, Henshaw, and Memphis soils. Henshaw soils are on terraces. They have an argillic horizon and a grayer subsoil than Patton soils. Uniontown soils are generally on slightly higher-lying terraces, and Memphis soils are on upland ridgetops and side slopes. Both soils have an argillic horizon and an ochric epipedon.

Typical pedon of Patton silt loam, overwash, in Union County; at a point that is 100 feet east of Kentucky Highway 130, 100 feet west of railroad, and 300 feet north of ditch; about 0.75 mile north of Morganfield:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; slightly acid; clear smooth boundary.

A1g—9 to 23 inches; very dark gray (10YR 3/1) silt loam; few fine faint dark grayish brown (10YR 4/2) mottles; weak very fine and fine angular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

B2g—23 to 42 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine faint very dark grayish brown

(10YR 3/2) mottles; moderate fine and medium angular blocky structure; firm; few wormcasts; slightly acid; gradual smooth boundary.
C1g—42 to 60 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct light olive brown (2.5Y 5/6) mottles; massive; firm; neutral.

Thickness of the solum ranges from 30 to 42 inches. Reaction ranges from slightly acid to mildly alkaline.

The A horizon has hue of 10YR, value of 3, and chroma of 1 or 2. Overwash layers, however, are brown (10YR 4/3). The B horizon has hue of 10YR to 5Y, value of 4 through 6, and chroma of 1 or 2. Mottles are in shades of gray or brown. The C horizon is similar in color to the B horizon. Texture is silt loam or silty clay loam.

Robinsonville series

The Robinsonville series consists of deep, well drained soils on flood plains. These soils formed in sandy alluvium. Permeability is moderate to moderately rapid. Slope is 0 to 2 percent.

Robinsonville soils are commonly adjacent to Huntington, Nolin, and Lindside soils on flood plains of similar elevation. Those soils have a fine-silty control section. Huntington soils have a mollic epipedon. Lindside soils are grayer in the control section than Robinsonville soils.

Typical pedon of Robinsonville fine sandy loam, in Union County; 400 feet south of Ohio River at a point that is 50 feet north of Kentucky Highway 667 and l.25 miles northeast of the intersection with Kentucky Highway 56; about 1.25 miles northeast of Shawneetown Bridge:

Ap—0 to 10 inches; dark grayish brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable; stratum of brown (10YR 5/3) fine sand 4 centimeters thick; few fine roots; few fine pores; mildly alkaline; clear smooth boundary.
C1—10 to 18 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable; stratum of brown fine sand 4 centimeters thick; few fine roots; few fine pores; mildly alkaline; clear smooth boundary.
C2—18 to 27 inches; brown (10YR 5/3) loamy fine sand; single grain; very friable; mildly alkaline; clear smooth boundary.
C3—27 to 45 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; very friable; thin bedding planes; moderately alkaline; gradual smooth boundary.
C4—45 to 60 inches; brown (10YR 4/3) loamy fine sand; few distinct light brownish gray (10YR 6/2) mottles in lower part; single grain; very friable; brown (10YR 5/3); strata 1 to 3 centimeters thick; moderately alkaline.

Reaction ranges from slightly acid through moderately alkaline.

The A horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The C horizons have hue of 10YR, value of 4 through 6, and chroma of 2 through 4. Texture is stratified fine sandy loam, loam, or loamy fine sand. Some pedons have thin strata of silt loam or loamy very fine sand.

Steinsburg series

The Steinsburg series consists of moderately deep, well drained soils on uplands. These soils formed in sandstone residuum. Permeability is moderately rapid. Slope ranges from 20 to 50 percent.

Steinsburg soils are commonly adjacent to Frondorf, Wellston, and Loring soils. Frondorf soils are on adjacent side slopes. They have a fine-loamy control section. Wellston soils are on side slopes of upland hills. They have a fine-silty control section and are more than 40 inches deep to bedrock. Loring soils are on higher-lying ridges. They have a fragipan and a fine-silty control section.

Typical pedon of Steinsburg loam, from an area of Steinsburg-Frondorf complex, 20 to 50 percent slopes, in Webster County; 0.5 mile southeast of Bull Creek and 1 mile northeast of gravel road, at a point that is 1.25 miles southeast of the intersection with Kentucky Highway 120; about 1.5 miles southeast of Liberty:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) loam; weak very fine granular structure; very friable; many fine roots; 5 percent coarse fragments of sandstone gravel; very strongly acid; clear smooth boundary.
A2—3 to 5 inches; brown (10YR 5/3) loam; weak fine subangular blocky structure; friable; many fine roots; 5 percent coarse fragments of sandstone gravel; very strongly acid; gradual smooth boundary.
B2—5 to 19 inches; yellowish brown (10YR 5/6) loam; moderate medium and coarse subangular blocky structure; very firm; common fine roots; few fine pores; 10 percent coarse fragments of sandstone gravel; very strongly acid; gradual smooth boundary.
C1—19 to 27 inches; strong brown (7.5YR 5/6) gravelly fine sandy loam; massive; friable; few fine roots; 25 percent coarse fragments of sandstone gravel; very strongly acid; gradual wavy boundary.
R—27 inches; hard, fine grained, gray sandstone.

Thickness of the solum ranges from 10 to 20 inches. Depth to bedrock ranges from 24 to 40 inches. Content of coarse fragments ranges from 5 to 15 percent in the solum and from 20 to 35 percent in the C horizon. Reaction ranges from strongly acid to very strongly acid.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma 3 through 6. Texture is loam or fine sandy loam. The C horizon is similar in color and texture to the B horizon.

Uniontown series

The Uniontown series consists of deep, moderately well drained to well drained soils on stream terraces. These soils formed in loamy alluvium. Permeability is moderate to moderately slow. Slope ranges from 0 to 12 percent.

Uniontown soils are similar to Memphis soils and are commonly adjacent to Henshaw, Memphis, Wilbur, and Patton soils. Henshaw soils have low chroma in the upper 10 inches of the argillic horizon. Wilbur soils are on flood plains and have a coarse-silty control section. Patton soils have a cambic B horizon and a mollic epipedon. The well drained Memphis soils formed in loess.

Typical pedon of Uniontown silt loam, 2 to 6 percent slopes, in Union County; 500 feet west of entrance road to Camp Breckinridge and 0.5 mile south of the intersection with U.S. Highway 60; about 2 miles east of Morganfield:

Ap—0 to 8 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; many fine roots; strongly acid; clear smooth boundary.

B21t—8 to 13 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint yellowish brown (10YR 5/6) and few fine faint pale brown (10YR 6/3) mottles; moderate fine angular blocky structure; firm; few thin patchy clay films; few fine roots; strongly acid; gradual smooth boundary.

B22—13 to 23 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct pale brown (10YR 6/3) mottles; moderate fine and medium angular blocky structure; firm; thin continuous clay films; few small black concretions; few fine roots; strongly acid; gradual smooth boundary.

B23t—23 to 34 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct pale brown (10YR 6/3) mottles; weak medium angular blocky structure; firm; thin patchy clay films; common small black concretions; few fine roots; slightly acid; gradual smooth boundary.

C1—34 to 40 inches; light olive brown (2.5Y 5/6) silty clay loam; few fine distinct pale brown (10YR 6/3) mottles; massive; firm; common brown concretions; few fine roots; mildly alkaline; clear smooth boundary.

C2—40 to 60 inches; light olive brown (2.5Y 5/4) silt loam; common medium faint light olive brown (2.5Y 5/6) and common medium distinct light yellowish brown (2.5Y 6/4) mottles; massive; friable; few small black concretions; common irregularly shaped calcium carbonate concretions, nodules 0.5 to 2 inches in diameter; moderately alkaline; calcareous.

Thickness of the solum ranges from 30 to 40 inches. Depth to bedrock is more than 5 feet. Unless the soil is limed, reaction is strongly acid to slightly acid in the upper part of the profile and neutral through moderately alkaline in the lower part.

The Ap horizon has hue of 10YR, value of 4 through 6, and chroma of 2 or 3. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 4 or 6. Mottles are in shades of brown. Texture is silt loam or silty clay loam. The C horizon has hue of 2.5Y, value of 5, and chroma of 4 or 6. Mottles are in shades of brown. Calcium carbonate concretions are common below a depth of 40 inches. Texture of the C horizon is silt loam or silty clay loam.

Wakeland series

The Wakeland series consists of deep, somewhat poorly drained soils on flood plains. These soils formed in loamy alluvium. Permeability is moderate. Slope ranges from 0 to 2 percent.

Wakeland soils are similar to Belknap soils and are commonly adjacent to Haymond, Wilbur, and Memphis soils. Belknap soils have an acid control section. Haymond soils are well drained. Wilbur soils are moderately well drained. Memphis soils are on uplands and have an argillic horizon.

Typical pedon of Wakeland silt loam, in Union County; 300 feet east of U.S. Highway 60, at a point that is 0.5 mile south of the intersection with Kentucky Highway 492; about 5 miles southwest of Morganfield:

Ap—0 to 11 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; few fine roots; medium acid; clear smooth boundary.

C1g—11 to 19 inches; grayish brown (10YR 5/2) silt loam; many medium faint pale brown (10YR 6/3) and few fine distinct light gray (10YR 7/1) mottles; weak fine granular and weak fine angular blocky structure; friable; few small brown concretions; neutral; gradual smooth boundary.

C2g—19 to 33 inches; grayish brown (10YR 5/2) silt loam; common fine distinct pale brown (10YR 6/3) and yellowish brown (10YR 5/6) mottles; weak fine granular structure; friable; common brown concretions; neutral; gradual smooth boundary.

C3g—33 to 60 inches; gray (10YR 6/1) silt loam; common fine distinct pale brown (10YR 6/3) and few fine distinct light yellowish brown (10YR 6/4) mottles; massive; firm; few brown concretions; neutral.

Depth to bedrock is more than 5 feet. Reaction ranges from medium acid to neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Texture is silt or silt loam. The C horizon has hue of 10YR, value of 5 through 6, and chroma of 2 or 3. Below a depth of 33 inches, however, chroma is 1. Mottles have hue of 10YR, value of 5 through 7, and chroma of 1 through 6. The C horizon has weak or moderate, granular or subangular blocky structure.

Waverly series.

The Waverly series consists of deep, poorly drained soils on flood plains. These soils formed in loamy alluvium. Permeability is moderate. Slope ranges from 0 to 2 percent.

Waverly soils are similar to Melvin soils and are commonly adjacent to Belknap, Collins, and Calloway soils. Mevlin soils have a nonacid, fine-silty control section. Belknap soils are somewhat poorly drained, and Collins soils are moderately well drained. Calloway soils are on uplands. They have a fine-silty control section and a fragipan.

Typical pedon of Waverly silt loam, in Webster County; 50 feet west of farm road, at a point that is 0.5 mile south of Kentucky Highway 270 and 1 mile west of U.S. Highway 41A; about 5 miles south of Dixon:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; few fine faint grayish brown (10YR 5/2) mottles; weak fine granular structure; friable; few fine roots; few fine brown concretions; strongly acid; clear smooth boundary.

B21g—8 to 16 inches; light brownish gray (10YR 6/2) silt loam; common medium faint light gray (10YR 7/1) and few fine distinct brown (10YR 4/3) mottles; weak medium subangular blocky structure; friable; few fine roots; few fine and medium brown concretions; very strongly acid; gradual smooth boundary.

B22g—16 to 30 inches; light brownish gray (10YR 6/2) silt loam; many medium faint light gray (10YR 6/1) and few fine distinct yellowish brown (10YR 5/6) mottles; weak medium and coarse subangular blocky structure; firm; few fine roots; few fine brown and black concretions; very strongly acid; gradual smooth boundary.

B23g—30 to 41 inches; light gray (10YR 6/1) silt loam; common medium distinct brown (10YR 5/3), yellowish brown (10YR 5/6), and few fine faint light brownish gray (10YR 6/2) mottles; weak fine and medium subangular blocky structure; firm; few fine roots; few fine brown concretions; very strongly acid; gradual smooth boundary.

C1g—41 to 50 inches; light brownish gray (10YR 6/2) silt loam; many medium faint light gray (10YR 7/2) and common medium distinct brown (10YR 5/3) mottles; massive; friable; few fine and medium brown and black concretions; strongly acid; gradual smooth boundary.

C2g—50 to 62 inches; light gray (10YR 6/1) silt loam; many medium faint light brownish gray (10YR 6/2), few medium distinct brown (10YR 5/3), and few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; strongly acid.

Thickness of the solum ranges from 30 to 44 inches. Depth to bedrock is more than 5 feet. Reaction is strongly acid or very strongly acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The B horizon has hue of 10YR, value of 6 or 7, and chroma of 1 or 2. The C horizon is similar in color to the B horizon.

Weinbach series

The Weinbach series consists of deep, somewhat poorly drained soils on stream terraces. These soils formed in mixed alluvium. Permeability is very slow. Slope ranges from 0 to 2 percent.

Weinbach soils are similar to Calloway soils and are commonly adjacent to Otwell, Melvin, and McGary soils. Calloway soils have an A'2 horizon. Otwell soils have a less grayish control section than Weinbach soils. Melvin and McGary soils do not have a fragipan. Melvin soils are poorly drained. McGary soils have a fine control section.

Typical pedon of Weinbach silt loam, in Union County; 200 feet east of gravel road and 300 feet east of Goose Pond Ditch, at a point that is 1 mile south of Kentucky Highway 871 and 4 miles northwest of the intersection with Kentucky Highway 360; about 5 miles northwest of Spring Grove:

Ap—0 to 9 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; medium acid; clear smooth boundary.

B1—9 to 13 inches; pale brown (10YR 6/3) silt loam; common fine distinct yellowish brown (10YR 5/4) and common fine faint light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; few fine roots; very strongly acid; clear smooth boundary.

B2—13 to 20 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct yellowish brown (10YR 5/4) and few fine faint pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable; few fine roots; very strongly acid; abrupt wavy boundary.

Bx1—20 to 30 inches; light brownish gray (10YR 6/2) silty clay loam; few fine faint light gray (10YR 6/1) and many medium distinct yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic parting to moderate coarse and medium angular blocky structure; very firm, brittle, and compact; thin patchy clay films on some ped faces; few small black concretions; very strongly acid; gradual smooth boundary.

Bx2—30 to 49 inches; light brownish gray (10YR 6/2) silty clay loam; few fine faint light gray (10YR 6/1) and many medium distinct yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic parting to moderate coarse and medium angular blocky structure; very firm, brittle, and compact; thin patchy clay films on some ped faces; few small black concretions; very strongly acid; gradual smooth boundary.

C—49 to 63 inches; brown (7.5YR 4/4) silt loam; few fine distinct light brownish gray (10YR 6/2) mottles; massive; firm; few dark brown stains; few rounded gravel 1 to 2 millimeters; strongly acid.

Thickness of solum ranges from 40 to 55 inches. Depth to the fragipan ranges from 20 to 30 inches. Depth to bedrock is more than 5 feet. Unless the soil is limed, reaction of the solum ranges from strongly acid to very strongly acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma 2 or 3. If present, the B1 and B2 horizons have hue of 10YR, value of 5 or 6, and chroma of 2 through 4. Mottles have chroma of 1 through 4. Texture ranges from silt loam to silty clay loam. The Bx horizon has hue of 10YR, value of 4 through 6, and chroma of 2 or 3. Mottles have chroma of 1 through 6. Texture is silt loam or silty clay loam. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. It is silt loam, loam, or silty clay loam and has thin strata of fine sand in some pedons.

Wellston series

The Wellston series consists of deep, well drained soils on uplands. These soils formed in loess and in the underlying residuum from sandstone, siltstone, and shale. Permeability is moderate. Slope ranges from 6 to 20 percent.

Wellston soils are similar to Memphis soils and are commonly adjacent to Loring, Frondorf, and Collins soils. Memphis soils formed in loess more than 48 inches thick. Loring soils have a fragipan. Frondorf soils are on the steeper side slopes. They have a fine-loamy control section and are less than 40 inches deep to bedrock. Collins soils are on flood plains. They do not have an argillic horizon.

Typical pedon of Wellston silt loam, in an area of Wellston silt loam, 6 to 12 percent slopes, in Webster County; 50 feet east of gravel road, at a point that is 150 feet east of Pennyrile Parkway and 1 mile northwest of the overpass at Kentucky Highway 370; about 4 miles southeast of Sebree:

Ap—0 to 7 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; many fine roots; very strongly acid; clear smooth boundary.

B1—7 to 13 inches; yellowish brown (10YR 5/6) silty clay loam; weak fine granular and subangular blocky structure; firm; many fine roots; very strongly acid; gradual smooth boundary.

B21t—13 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; firm; thin discontinuous clay films on faces of peds and in some pores; common fine roots; very strongly acid; clear smooth boundary.

IIB22t—20 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous clay films on peds and in pores; 10 percent coarse fragments of sandstone in the lower part; very strongly acid; gradual smooth boundary.

IIC—34 to 59 inches; yellowish brown (10YR 5/4) channery sandy clay loam; massive; firm; 25 percent coarse fragments of sandstone and ironstone as much as 3 inches in length; strongly acid; clear smooth boundary.

R—59 inches; hard sandstone.

Thickness of the solum ranges from 32 to 48 inches. Depth to bedrock is more than 40 inches. Unless the soil is limed, reaction is strongly acid or very strongly acid throughout the profile. Range in coarse fragments is from 0 to 15 percent in the lower part of the IIB horizon and from 15 to 35 percent in the IIC horizon.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is silt loam. Severely eroded soils, however, range to silty clay loam. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The B horizon has hue of 10YR or 7.5YR, value or 4 or 5, and chroma of 4 or 6. Texture is silt loam or silty clay loam. Mottles of lower chroma are in the lower part of some pedons. The C horizon is similar in color to the B horizon. Mottles are in shades of brown and gray. Texture ranges from channery sandy clay loam to channery sandy loam. Some pedons are gravelly.

Wheeling series

The Wheeling series consists of deep, well drained soils on stream terraces. These soils formed in mixed alluvium. Permeability is moderate. Slope ranges from 0 to 12 percent.

Wheeling soils are similar to Memphis soils and are commonly adjacent to Otwell, Weinbach, and Melvin soils. Memphis soils are on uplands and have a fine-silty control section. Otwell and Weinbach soils are on adjacent stream terraces at a lower elevation than Wheeling soils. They have a fine-silty control section, a fragipan, and are not so well drained. Melvin soils are on flood plains. They have a fine-silty control section, are poorly drained, and do not have an argillic horizon.

Typical pedon of Wheeling silt loam, in an area of Wheeling silt loam, 2 to 6 percent slopes, in Union County; 100 feet east of gravel road, at a point that is 1.5 miles northwest of the intersection with Kentucky Highway 56; about 2.5 miles northwest of Spring Grove:

Ap—0 to 9 inches; brown (10YR 5/3) silt loam; weak fine granular structure; very friable; many fine roots; medium acid; clear smooth boundary.

B21t—9 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; firm; thin patchy clay films; many fine roots; strongly acid; gradual smooth boundary.

B22t—16 to 31 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; thin patchy clay films on ped faces and in pores; few fine roots; strongly acid; clear smooth boundary.
IIB23t—31 to 47 inches; yellowish brown (10YR 5/4) fine sandy loam; moderate coarse subangular blocky structure; firm; thin patchy clay films; few fine black coatings on peds; strongly acid; gradual smooth boundary.
IIC—47 to 65 inches; yellowish brown (10YR 5/6) fine sandy loam; massive; friable; very strongly acid.

Thickness of the solum ranges from 40 to 56 inches. Depth to bedrock is more than 5 feet. Unless the soil is limed, reaction ranges from strongly acid to medium acid throughout the profile.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. In some places, the lower layer of the B horizon has mottles in shades of brown. Structure of the B horizon is weak or moderate, fine through coarse subangular blocky. Texture ranges from fine sandy loam to silty clay loam. The C horizon is similar in color to the B horizon, but it may include value of 6. Texture ranges from silty clay loam to fine sandy loam.

Wilbur series

The Wilbur series consists of deep, moderately well drained soils on flood plains. These soils formed in loamy alluvium. Permeability is moderate. Slope is 0 to 2 percent.

Wilbur soils are similar to Collins soils and are commonly adjacent to Haymond, Wakeland, and Memphis soils. Collins soils have an acid control section. Haymond soils are well drained and do not have low chroma above a depth of 30 inches. Wakeland soils are somewhat poorly drained and are grayer in the control section than Wilbur soils. Memphis soils are on uplands and have an argillic horizon.

Typical pedon of Wilbur silt loam, in Union County; 150 feet northwest of Kentucky Highway 130, at a point that is 1.75 miles southwest of the intersection with Kentucky Highway 56; about 1.5 miles southwest of Morganfield:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; few fine faint grayish brown (10YR 5/2) mottles; weak fine granular structure; friable; few fine roots; slightly acid; clear smooth boundary.
C1—9 to 18 inches; brown (10YR 4/3) silt loam; common fine faint grayish brown (10YR 5/2) mottles; massive; thin bedding planes; firm; few fine roots; few small brown concretions; slightly acid; gradual smooth boundary.
C2—18 to 25 inches; brown (10YR 4/3) silt loam; few fine distinct light gray (10YR 7/2) and common fine distinct light brownish gray (10YR 6/2) mottles; massive; thin bedding planes; firm; few fine roots; many fine pores; few small brown concretions; slightly acid; gradual smooth boundary.
C3—25 to 42 inches; brown (10YR 4/3) silt loam; many coarse distinct light brownish gray (10YR 6/2) and few medium light gray (10YR 7/2) mottles; massive; bedding planes; firm; few fine roots in upper part; common brown concretions; slightly acid; clear smooth boundary.
C4g—42 to 60 inches; grayish brown (10YR 5/2) silt loam; many medium distinct brownish yellow (10YR 6/6) and common medium faint light brownish gray (10YR 6/2) mottles; massive; firm; few small dark brown concretions; slightly acid.

Depth to bedrock is more than 5 feet. Reaction of the control section ranges from medium acid to neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The C horizon to a depth of 40 inches has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Below a depth of 40 inches, chroma is 2 through 4. Mottles are in shades of brown and gray.

Zanesville series

The Zanesville series consists of deep, moderately well drained to well drained soils on uplands. These soils formed in loess and in the underlying residuum of sandstone, siltstone, and shale. Permeability is moderate above the fragipan and slow in the fragipan. Slope ranges from 6 to 12 percent.

Zanesville soils are similar to Loring soils and are commonly adjacent to Loring, Wellston, and Collins soils. Loring soils are on the higher-lying convex ridges and developed in loess more than 48 inches thick. Wellston soils are on moderately steep side slopes. They do not have a fragipan. Collins soils are on flood plains. They have a coarse-silty control section and do not have a fragipan.

Typical pedon of Zanesville silt loam, in an area of Zanesville silt loam, 6 to 12 percent slopes, in Webster County; 500 feet south of Kentucky Highway 630 and 0.5 mile east of the intersection with Kentucky Highway 264; about 5 miles southeast of Dixon:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many fine roots; very strongly acid; clear smooth boundary.
B1—6 to 9 inches; strong brown (7.5YR 5/6) silt loam; weak fine subangular blocky structure; friable; many fine roots; few fine pores; very strongly acid; gradual smooth boundary.
B21t—9 to 17 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; many fine roots; thin patchy clay films on ped faces and in pores; very strongly acid; gradual smooth boundary.

B22t—17 to 30 inches; brown (7.5YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; firm; few fine roots; thin continuous clay films on peds and in pores; very strongly acid; clear wavy boundary.

Bx—30 to 47 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light gray (10YR 7/2) mottles; weak very coarse prismatic structure parting to moderate fine and medium subangular blocky; firm, brittle, and compact; thin patchy clay films on some peds; very strongly acid; gradual wavy boundary.

IIC—47 to 69 inches; brown (10YR 5/3) channery silty clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; massive; firm; thin patchy clay films on some coarse fragments; 40 percent coarse fragments of sandstone and siltstone; very strongly acid; abrupt smooth boundary.

R—69 inches; sandstone.

Thickness of the solum ranges from 40 to 55 inches. Depth to bedrock is 60 to 80 inches. Depth to the fragipan ranges from 24 to 32 inches. Unless the soil is limed, reaction is strongly acid or very strongly acid throughout the profile.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4. Some pedons have an A1 horizon that has lower value and chroma. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 through 6. It is heavy silt loam or silty clay loam. The Bx horizon is similar in color to the B2t horizon and has mottles that include chroma of 2 or less. It is silty clay loam or sandy clay loam. The C horizon is similar to the Bx horizon. It has as much as 45 percent coarse fragments.

references

(1) Allan, P. F., L. E. Garland, and R. Dugan. 1963. Rating northeastern soils for their suitability for wildlife habitat. 28th North Am. Wildl. Nat. Resour. Conf. Wildl. Manage. Inst., pp. 247-261, illus.

(2) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(3) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(4) Beck, Donald E. 1962. Yellow-poplar site index curves. U.S. Dep. Agric., Forest Serv., Southeast. Forest Exp. Stn. Res. Note 180, 2 pp., illus.

(5) Broadfoot, W. M. and R. M. Krinard, 1959. Guide for evaluating sweetgum sites. U.S. Dep. Agr., Forest Serv., South. Forest Exp. Stn. Occas. Pap. 176, 8 pp., illus.

(6) Broadfoot, W. M. 1960. Field guide for evaluating cottonwood sites. U.S. Dep. Agric., Forest Serv., South. Forest Exp. Stn. Occas. Pap. 178, 6 pp., illus.

(7) Cline, Marlin G. 1949. Basic principles of soil classification. Soil Sci. 67: 81-91.

(8) Coile, T. S. and F. X. Schumacher. 1953. Site index of young stands of loblolly and shortleaf pines in the Piedmont Plateau Region. J. For. 51: 432-435, illus.

(9) Kentucky Conservation Needs Inventory Committee. 1970. Kentucky soil and water conservation needs inventory. 256 pp., illus.

(10) Marean, Herbert W. 1902. Soil survey of Union County, Kentucky. U.S. Dep. Agric. Bur. of soils, vol. 16, pp. 425-440.

(11) Schnur, G. Luther. 1937. Yield, stand, and volume tables for even-aged upland oak forest. U.S. Dep. Agric. Tech. Bull. 560, 88 pp., illus. [Reprinted 1961]

(12) Simonson, Roy W. 1965. Soil classificaiton in the United States. Sci. 137 1027-1034.

(13) Soil Science Society of America and American Society of Agronomy. 1966. Soil Surveys and Land Use Planning. 196 pp., illus.

(14) Uhland, R. E. and A. M. O'Neal. 1951. Soil permeability determinations for use in soil and water conservation. Soil Conserv. Serv. Tech. Pap. 101, 36 pp., illus.

(15) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]

(16) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.

(17) United States Department of Agriculture. 1961. Yield of Virginia pine. Forest Serv., Southeast. Forest Exp. Stn. Pap. 124, 11 pp.

(18) United States Department of Agriculture. 1967. Soil survey laboratory data and descriptions for some soils of Kentucky. Soil Conserv. Serv. in coop. with Ky. Agric. Exp. Stn., Soil Surv. Invest. Rep. 1, 50 pp., illus.

(19) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(20) United States Department of Agriculture. 1977. Soil survey of Hopkins County, Kentucky. U.S. Dep. Agric. Soil Conserv. Serv. in coop with Ky. Agric. Exp. Stn., 62 pp., illus.

(21) United States Department of Commerce Census of Population. 1973. 1970 census of population. Vol. 1, part 19, 1098 pp., illus.

(22) United States Department of Commerce Bureau of the Census. 1977. 1974 census of agriculture. Vol. 1, part 17, book 2, 726 pp., illus.

glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	more than 5.2

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. Mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock. Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation, sprinkler. Application of water to soils to assist in production of crops. Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Miscellaneous areas. Areas that have little or no natural soil and support little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	Less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and

are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an overdry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data were recorded in the period 1951-75 at Henderson, Kentucky]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	43.1	25.5	34.3	70	-4	6	3.51	1.79	4.90	6	4.0
February	47.2	28.3	37.8	72	1	15	3.24	1.66	4.51	6	3.2
March	55.9	35.9	46.0	81	14	99	4.84	2.32	6.90	8	3.8
April	68.7	46.9	57.8	86	27	246	4.30	2.57	5.84	8	.3
May	77.6	55.4	66.5	91	36	512	4.31	2.74	5.72	8	.0
June	85.8	63.3	74.6	97	46	738	3.78	2.30	5.09	7	.0
July	88.7	66.7	77.7	98	51	859	3.99	1.89	5.70	7	.0
August	87.9	64.6	76.3	98	49	815	3.20	1.61	4.50	5	.0
September	82.1	58.1	70.1	97	39	603	3.09	1.32	4.53	5	.0
October	71.9	47.0	59.5	91	27	305	2.38	.94	3.56	5	.0
November	57.0	37.1	47.0	80	15	47	3.56	1.86	4.93	6	1.1
December	45.8	29.3	37.6	70	1	22	3.59	1.84	5.02	7	1.9
Yearly:											
Average	67.6	46.5	57.1	---	---	---	---	---	---	---	---
Extreme	---	---	---	101	-7	---	---	---	---	---	---
Total	---	---	---	---	---	4,267	43.79	37.92	49.44	78	14.3

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1951-76 at Henderson, Kentucky]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 2	April 10	April 20
2 years in 10 later than--	March 28	April 6	April 16
5 years in 10 later than--	March 17	March 28	April 9
First freezing temperature in fall:			
1 year in 10 earlier than--	October 29	October 20	October 10
2 years in 10 earlier than--	November 2	October 24	October 15
5 years in 10 earlier than--	November 11	November 2	October 26

TABLE 3.--GROWING SEASON

[Data were recorded in the period 1951-75 at Henderson, Kentucky]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	222	198	183
8 years in 10	227	205	189
5 years in 10	238	218	199
2 years in 10	248	231	210
1 year in 10	254	238	215

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Union County	Webster County	Total--	
				Area	Extent
		Acres	Acres	Acres	Pct
As	Ashton silt loam	900	0	900	0.2
Bn	Belknap silt loam	1,194	32,686	33,880	7.8
Ca	Calloway silt loam	13	3,641	3,654	0.8
Co	Collins silt loam	1,024	16,708	17,732	4.1
Du	Dumps, mine	483	66	549	0.1
FdE	Frondorf silt loam, 20 to 30 percent slopes	2,181	8,854	11,035	2.5
GnB	Grenada silt loam, 2 to 6 percent slopes	624	13,999	14,623	3.4
Ha	Haymond silt loam	3,168	0	3,168	0.7
He	Henshaw silt loam	3,902	254	4,156	1.0
Hs	Huntington silt loam	5,212	96	5,308	1.2
Hu	Huntington-Robinsonville complex	1,679	0	1,679	0.4
Ka	Karnak silt loam, overwash	3,138	3,902	7,040	1.6
Kc	Karnak silty clay	2,948	6,244	9,192	2.1
Ld	Lindside silty clay loam	1,756	95	1,851	0.4
LoB	Loring silt loam, 2 to 6 percent slopes	1,935	23,123	25,058	5.8
LoC	Loring silt loam, 6 to 12 percent slopes	1,284	7,361	8,645	2.0
MaC	Markland silty clay loam, 6 to 12 percent slopes	567	1,442	2,009	0.5
Md	Markland-Collins complex	0	1,602	1,602	0.4
Mg	McGary silt loam	1,759	10,794	12,553	2.9
Mm	Melvin silty clay loam	3,702	0	3,702	0.9
Mn	Melvin silty clay loam, ponded	154	111	265	0.1
MoB	Memphis silt loam, 2 to 6 percent slopes	25,538	10,298	35,836	8.1
MoC	Memphis silt loam, 6 to 12 percent slopes	12,296	2,214	14,510	3.3
MpC3	Memphis silty clay loam, 6 to 12 percent slopes, severely eroded	24,589	1,675	26,264	6.0
MpD3	Memphis silty clay loam, 12 to 30 percent slopes, severely eroded	18,242	334	18,576	4.3
Ne	Newark silty clay loam	4,798	0	4,798	1.1
No	Nolin silty clay loam	8,591	0	8,591	2.0
OtA	Otwell silt loam, 0 to 2 percent slopes	1,558	149	1,707	0.4
OtB	Otwell silt loam, 2 to 6 percent slopes	1,805	1,100	2,905	0.7
Pa	Patton silt loam	8,690	0	8,690	2.0
Po	Patton silt loam, overwash	14,102	461	14,563	3.4
Ro	Robinsonville fine sandy loam	1,775	0	1,775	0.4
SnE	Steinsburg-Frondorf complex, 20 to 50 percent slopes	2,340	3,173	5,513	1.3
Ud	Udorthents, steep	433	3,278	3,711	0.9
UnA	Uniontown silt loam, 0 to 2 percent slopes	4,028	65	4,093	0.9
UnB	Uniontown silt loam, 2 to 6 percent slopes	14,579	400	14,979	3.4
UoC3	Uniontown silty clay loam, 6 to 12 percent slopes, severely eroded	1,736	39	1,775	0.4
Wa	Wakeland silt loam	10,904	516	11,420	2.6
Wb	Waverly silt loam	2	4,059	4,061	0.9
Wh	Weinbach silt loam	1,540	1,148	2,688	0.6
WlC	Wellston silt loam, 6 to 12 percent slopes	124	641	765	0.2
WlD	Wellston silt loam, 12 to 20 percent slopes	775	4,975	5,750	1.3
WpC3	Wellston silty clay loam, 6 to 12 percent slopes, severely eroded	94	337	431	0.1
WpD3	Wellston silty clay loam, 12 to 20 percent slopes, severely eroded	3,370	23,278	26,648	6.1
WsA	Wheeling silt loam, 0 to 2 percent slopes	766	0	766	0.2
WsB	Wheeling silt loam, 2 to 6 percent slopes	1,712	0	1,712	0.4
WtC3	Wheeling silty clay loam, 6 to 12 percent slopes, severely eroded	841	0	841	0.2
Wu	Wilbur silt loam	13,048	41	13,089	3.0
ZnC	Zanesville silt loam, 6 to 12 percent slopes	0	1,547	1,547	0.4
ZoC3	Zanesville silty clay loam, 6 to 12 percent slopes, severely eroded	1,470	25,803	27,273	6.3
	Water	491	261	752	0.2
	Total	217,860	216,770	434,630	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Only soils suitable for these crops are listed]

Map symbol and soil name	Corn	Tobacco	Wheat	Soybeans	Grass-legume hay	Pasture
	Bu	Lb	Bu	Bu	Ton	AUM*
As---- Ashton	135	3,200	45	45	4.5	9.0
Bn---- Belknap	125	---	---	40	4.5	9.0
Ca---- Calloway	80	---	---	35	4.0	8.0
Co---- Collins	110	---	40	40	4.5	9.0
Du.** Dumps						
FdE---- Frondorf	---	---	---	---	2.0	4.0
GnB---- Grenada	90	2,550	45	30	4.0	8.0
Ha---- Haymond	120	3,000	45	45	4.0	8.0
He---- Henshaw	110	---	45	45	4.0	8.0
Hs---- Huntington	135	3,300	45	45	4.5	9.0
Hu---- Huntington-Robinsonville	105	3,000	40	40	4.5	9.0
Ka, Kc---- Karnak	95	---	---	35	3.5	7.0
Ld---- Lindside	125	3,000	45	45	4.5	9.0
LoB---- Loring	100	2,550	40	30	4.0	8.0
LoC---- Loring	90	2,450	35	25	3.5	7.0
MaC---- Markland	---	---	25	---	2.0	4.0
Md---- Markland-Collins	---	---	---	---	2.5	5.0
Mg---- McGary	80	---	---	30	3.0	6.0
Mm---- Melvin	85	---	---	35	3.5	7.0
MoB---- Memphis	120	2,500	45	45	4.5	9.0

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Tobacco	Wheat	Soybeans	Grass-legume hay	Pasture
	Bu	Lb	Bu	Bu	Ton	AUM*
MoC, MpC3---- Memphis	85	2,400	35	35	4.0	8.0
MpD3---- Memphis	---	---	---	---	3.0	6.0
Ne---- Newark	100	2,500	45	40	4.5	8.5
No---- Nolin	135	3,300	45	45	4.5	8.5
OtA---- Otwell	105	2,800	40	35	3.5	7.0
OtB---- Otwell	105	2,800	40	35	3.5	7.0
Pa, Po---- Patton	135	---	---	45	4.0	8.0
Ro---- Robinsonville	115	---	---	40	4.0	8.0
Ud.** Udorthents						
UnA---- Uniontown	130	2,800	45	45	4.5	9.0
UnB---- Uniontown	130	2,800	45	45	4.5	9.0
UoC3---- Uniontown	75	2,200	30	25	4.0	7.5
Wa---- Wakeland	115	---	35	40	3.5	7.0
Wb---- Waverly	95	---	---	30	3.5	7.0
Wh---- Weinbach	110	---	---	35	3.5	7.0
WlC---- Wellston	100	2,800	40	35	4.0	8.0
WlD---- Wellston	95	---	30	---	3.5	7.0
WpC3---- Wellston	90	---	30	---	3.5	7.0
WpD3---- Wellston	---	---	---	---	3.0	6.0
WsA---- Wheeling	110	3,200	40	40	4.5	9.0
WsB---- Wheeling	110	3,100	40	40	4.5	9.0
WtC3---- Wheeling	90	2,300	35	30	4.0	8.0

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Tobacco	Wheat	Soybeans	Grass-legume hay	Pasture
	Bu	Lb	Bu	Bu	Ton	AUM*
Wu---------- Wilbur	120	---	45	40	4.0	8.0
ZnC---------- Zanesville	85	2,450	35	30	3.5	7.0
ZoC3---------- Zanesville	60	2,000	25	---	3.0	6.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)	
		Erosion (e)	Wetness (w)
		Acres	Acres
I:			
Union County	40,172	---	---
Webster County	17,005	---	---
II:			
Union County	93,116	46,193	46,923
Webster County	82,982	48,920	34,064
III:			
Union County	26,806	13,704	13,102
Webster County	41,553	11,763	29,790
IV:			
Union County	29,505	29,505	---
Webster County	32,829	32,829	---
V:			
Union County	154	---	154
Webster County	111	---	111
VI:			
Union County	24,360	24,360	---
Webster County	33,908	33,908	---
VII:			
Union County	2,340	2,340	---
Webster County	4,775	4,775	---
VIII:			
Union County	---	---	---
Webster County	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
As Ashton	1o	Slight	Slight	Slight	Severe	Northern red oak Pin oak Yellow-poplar Sweetgum Shumard oak	85 103 95 77 94	Eastern white pine, yellow-poplar, black walnut, sweetgum, cherrybark oak.
Bn Belknap	2w	Slight	Moderate	Slight	Severe	Eastern cottonwood American sycamore Yellow-poplar Sweetgum Pin oak	100 --- 90 --- 90	Eastern cottonwood, red maple, American sycamore, sweetgum, baldcypress.
Ca Calloway	1w	Slight	Moderate	Slight	Severe	Cherrybark oak Loblolly pine Sweetgum	90 90 90	Cherrybark oak, Shumard oak, sweetgum, yellow-poplar.
Co Collins	1o	Slight	Slight	Slight	Severe	Green ash Eastern cottonwood Cherrybark oak Yellow-poplar	95 115 110 108	Green ash, eastern cottonwood, cherrybark oak, yellow-poplar.
FdE: Frondorf (south aspect)	3r	Moderate	Moderate	Moderate	Moderate	Black oak	77	Shortleaf pine, loblolly pine, Virginia pine.
Frondorf (north aspect)	2r	Moderate	Moderate	Slight	Severe	Northern red oak Virginia pine	86 78	Yellow-poplar, shortleaf pine, black walnut, eastern white pine, loblolly pine.
GnB Grenada	3o	Slight	Slight	Slight	Moderate	Cherrybark oak Southern red oak Loblolly pine Shortleaf pine Sweetgum	85 80 85 75 80	Cherrybark oak, Shumard oak, loblolly pine, white oak, shortleaf pine, sweetgum.
Ha Haymond	1o	Slight	Slight	Slight	Severe	Yellow-poplar White oak Black walnut	100 90 70	Eastern white pine, black walnut, yellow-poplar.
He Henshaw	1w	Slight	Moderate	Slight	Severe	Pin oak Yellow-poplar Sweetgum	95 95 95	White ash, sweetgum, eastern cottonwood, yellow-poplar.
Hs Huntington	1o	Slight	Slight	Slight	Severe	Yellow-poplar Northern red oak	95 85	Yellow-poplar, black walnut, eastern white pine, white ash.
Hu:* Huntington	1o	Slight	Slight	Slight	Severe	Yellow-poplar Northern red oak	95 85	Yellow-poplar, black walnut, eastern white pine, white ash.
Robinsonville	1o	Slight	Slight	Slight	Severe	Eastern cottonwood Green ash Sweetgum American sycamore	110 85 105 115	Eastern cottonwood, sweetgum, American sycamore.
Ka, Kc Karnak	1w	Slight	Severe	Severe	Severe	Pin oak Swamp white oak Eastern cottonwood Green ash	96 --- --- ---	Pin oak, swamp white oak, eastern cottonwood, green ash, baldcypress, sweetgum, pecan.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
Ld---------- Lindside	1o	Slight	Slight	Slight	Severe	Northern red oak----	85	Eastern white pine, yellow-poplar.
						Yellow-poplar-------	95	
						Black walnut--------	---	
						White ash-----------	---	
						White oak-----------	85	
LoB, LoC---------- Loring	3o	Slight	Slight	Slight	Severe	Cherrybark oak------	86	Loblolly pine, yellow-poplar, southern red oak.
						Sweetgum------------	90	
						Southern red oak----	74	
						Loblolly pine-------	85	
MaC---------- Markland	2c	Slight	Moderate	Slight	Severe	White oak-----------	75	Eastern white pine, yellow-poplar, white ash.
						Northern red oak----	75	
Md:* Markland----------	2c	Moderate	Moderate	Slight	Severe	White oak-----------	75	Eastern white pine, yellow-poplar, white ash.
						Northern red oak----	75	
Collins----------	1o	Slight	Slight	Slight	Severe	Green ash-----------	95	Green ash, eastern cottonwood, cherrybark oak.
						Eastern cottonwood--	115	
						Cherrybark oak------	110	
Mg---------- McGary	3w	Slight	Moderate	Slight	Moderate	Pin oak-------------	66	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
						Sweetgum------------	---	
						White oak-----------	66	
						White ash-----------	---	
						Red maple-----------	---	
Mm---------- Melvin	1w	Slight	Severe	Severe	Severe	Pin oak-------------	98	Baldcypress, pin oak, sweetgum.
						Eastern cottonwood--	96	
						Sweetgum------------	92	
Mn---------- Melvin	1w	Slight	Severe	Severe	Severe	----------	---	Baldcypress.
MoB, MoC, MpC3, MpD3---------- Memphis	2o	Slight	Slight	Slight	Severe	Loblolly pine-------	90	Cherrybark oak, loblolly pine, sweetgum, yellow-poplar.
						Sweetgum------------	90	
						Yellow-poplar-------	98	
Ne---------- Newark	1w	Slight	Moderate	Slight	Severe	Pin oak-------------	99	Eastern cottonwood, sweetgum, loblolly pine, red maple, American sycamore, eastern white pine, yellow poplar.
						Eastern cottonwood--	94	
						Northern red oak----	85	
						Yellow-poplar-------	95	
						Sweetgum------------	88	
No---------- Nolin	1o	Slight	Slight	Slight	Severe	Sweetgum------------	92	Sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, cherrybark oak.
						Yellow-poplar-------	107	
OtA, OtB---------- Otwell	3o	Slight	Slight	Slight	Moderate	White oak-----------	72	Eastern white pine, yellow-poplar, white ash.
						Yellow-poplar-------	---	
						Sugar maple---------	---	
Pa, Po---------- Patton	2w	Slight	Severe	Moderate	Severe	Pin oak-------------	85	Eastern white pine, baldcypress, red maple, white ash.
						White oak-----------	75	
						Sweetgum------------	80	
						Northern red oak----	75	
Ro---------- Robinsonville	1o	Slight	Slight	Slight	Severe	Eastern cottonwood--	110	Eastern cottonwood, sweetgum, American sycamore.
						Green ash-----------	85	
						Sweetgum------------	105	
						American sycamore---	115	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
SnE:*								
Steinsburg	3f	Moderate	Severe	Moderate	Moderate	Virginia pine	70	Eastern white pine,
						Yellow-poplar	---	Virginia pine,
						Northern red oak	82	shortleaf pine.
Frondorf (north aspect)	2r	Moderate	Moderate	Slight	Severe	Northern red oak	86	Yellow poplar,
						Virginia pine	78	shortleaf pine, black walnut, eastern white pine, loblolly pine.
Frondorf (south aspect)	3r	Severe	Severe	Moderate	Moderate	Black oak	70	Shortleaf pine, loblolly pine, Virginia pine.
UnA, UnB Uniontown	2o	Slight	Slight	Slight	Severe	Northern red oak	81	Yellow-poplar, eastern
						Yellow-poplar	91	white pine, black
						Sweetgum	90	walnut.
UoC3 Uniontown	3o	Slight	Slight	Slight	Moderate	Northern red oak	70	Virginia pine,
						Virginia pine	70	loblolly pine.
Wa Wakeland	1w	Slight	Moderate	Slight	Severe	Pin oak	95	Eastern white pine,
						Sweetgum	95	baldcypress, American sycamore, red maple, white ash.
Wb Waverly	1w	Slight	Severe	Severe	Severe	Eastern cottonwood	91	Eastern cottonwood,
						Nuttall oak	100	willow oak, sweetgum,
						Willow oak	95	American sycamore,
						Loblolly pine	95	water tupelo, loblolly
						Sweetgum	100	pine.
						Pin oak	110	
Wh Weinbach	2w	Slight	Moderate	Moderate	Severe	White oak	75	Eastern white pine,
						Pin oak	85	baldcypress, white
						Yellow-poplar	90	ash, red maple,
						Sweetgum	88	yellow-poplar, American sycamore.
WlC, WpC3 Wellston	2o	Slight	Slight	Slight	Severe	Northern red oak	71	Eastern white pine,
						Yellow-poplar	90	black walnut, yellow-
						Virginia pine	70	poplar.
WlD Wellston	2r	Moderate	Moderate	Slight	Moderate	Northern red oak	81	Eastern white pine,
						Yellow-poplar	97	black walnut,
						Virginia pine	76	yellow-poplar.
WpD3 Wellston	3r	Moderate	Moderate	Moderate	Moderate	Northern red oak	70	Eastern white pine,
						Yellow-poplar	85	Virginia pine.
						Virginia pine	66	
WsA, WsB, WtC3 Wheeling	2o	Slight	Slight	Slight	Severe	Northern red oak	80	Eastern white pine,
						Yellow-poplar	90	yellow-poplar, black walnut.
Wu Wilbur	1o	Slight	Slight	Slight	Severe	Yellow-poplar	100	Eastern white pine, black walnut, yellow-poplar.
ZnC Zanesville	3o	Slight	Slight	Slight	Moderate	Northern red oak	68	Virginia pine, eastern
						Virginia pine	70	white pine, shortleaf
						Shortleaf pine	67	pine.
ZoC3 Zanesville	4d	Slight	Slight	Moderate	Slight	Northern red oak	60	Virginia pine,
						Virginia pine	70	shortleaf pine.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
As Ashton	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
Bn Belknap	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, floods.
Ca Calloway	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Co Collins	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
Du.* Dumps					
FdE Frondorf	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GnB Grenada	Moderate: percs slowly, wetness.	Moderate: wetness.	Moderate: slope, percs slowly, wetness.	Slight	Slight.
Ha Haymond	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
He Henshaw	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Hs Huntington	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
Hu*: Huntington	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
Robinsonville	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate floods.
Ka, Kc Karnak	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: too clayey, wetness.
Ld Lindside	Severe: floods.	Moderate: floods. wetness.	Moderate: too clayey, floods.	Moderate: too clayey.	Moderate: too clayey, floods.
LoB Loring	Moderate: percs slowly, wetness.	Moderate: wetness.	Moderate: slope, percs slowly, wetness.	Slight	Slight.
LoC Loring	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness.	Severe: slope.	Slight	Moderate: slope.
MaC Markland	Severe: floods.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: too clayey, slope, floods.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Md:*					
Markland	Severe: slope, floods.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Collins	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
Mg McGary	Severe: floods, wetness, percs slowly.	Moderate: wetness.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Mm Melvin	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Mn Melvin	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
MoB Memphis	Slight	Slight	Moderate: slope.	Slight	Slight.
MoC, MpC3 Memphis	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
MpD3 Memphis	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.
Ne Newark	Severe: floods, wetness.	Moderate: wetness, too clayey, floods.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: floods, wetness.
No Nolin	Severe: floods.	Moderate: too clayey, floods.	Moderate: floods.	Moderate: too clayey.	Moderate: floods.
OtA, OtB Otwell	Severe: floods, percs slowly.	Slight	Severe: percs slowly.	Slight	Slight.
Pa, Po Patton	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ro Robinsonville	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
SnE:*					
Steinsburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Frondorf	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ud.* Udorthents					
UnA Uniontown	Severe: floods.	Slight	Slight	Slight	Slight.
UnB Uniontown	Severe: floods.	Slight	Moderate: slope.	Slight	Slight.
UoC3 Uniontown	Severe: floods.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: too clayey, slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Wa Wakeland	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, floods.
Wb Waverly	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Wh Weinbach	Severe: floods, percs slowly, wetness.	Moderate: wetness.	Severe: percs slowly, wetness.	Moderate: wetness.	Slight.
W1C Wellston	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
W1D Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
WpC3 Wellston	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: slope.
WpD3 Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.
WsA Wheeling	Slight	Slight	Slight	Slight	Slight.
WsB Wheeling	Slight	Slight	Moderate: slope.	Slight	Slight.
WtC3 Wheeling	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: slope, too clayey.
Wu Wilbur	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight	Moderate: floods.
ZnC Zanesville	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness.	Severe: slope.	Slight	Moderate: slope.
ZoC3 Zanesville	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness.	Severe: slope.	Moderate: too clayey.	Moderate: slope, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements.							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
As---- Ashton	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Bn---- Belknap	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ca---- Calloway	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Co---- Collins	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Du.* Dumps										
FdE---- Frondorf	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
GnB---- Grenada	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ha---- Haymond	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
He---- Henshaw	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Hs---- Huntington	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Hu:*										
Huntington----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Robinsonville----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ka, Kc---- Karnak	Very poor.	Poor	Poor	Poor	Very poor.	Good	Good	Poor	Poor	Good.
Ld---- Lindside	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
LoB---- Loring	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LoC---- Loring	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MaC---- Markland	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Md:*										
Markland----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Collins----	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Mg---- McGary	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Mm---------- Melvin	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Mn---------- Melvin	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
MoB---------- Memphis	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MoC, MpC3---------- Memphis	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MpD3---------- Memphis	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ne---------- Newark	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
No---------- Nolin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OtA, OtB---------- Otwell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pa, Po---------- Patton	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Ro---------- Robinsonville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SnE:*										
Steinsburg--------	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Frondorf----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Ud.* Udorthents										
UnA---------- Uniontown	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
UnB---------- Uniontown	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UoC3---------- Uniontown	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Wa---------- Wakeland	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair
Wb---------- Waverly	Poor	Fair	Good	Fair	Fair	Good	Fair	Fair	Fair	Fair.
Wh---------- Weinbach	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
WlC---------- Wellston	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WlD---------- Wellston	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WpC3---------- Wellston	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
WpD3---------- Wellston	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WsA---------- Wheeling	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WsB---------- Wheeling	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WtC3---------- Wheeling	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Wu---------- Wilbur	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
ZnC, ZoC3---------- Zanesville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
As---- Ashton	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Bn---- Belknap	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.	Moderate: floods, wetness.
Ca---- Calloway	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, low strength.	Moderate: wetness.
Co---- Collins	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.	Moderate: floods.
Du.* Dumps						
FdE---- Frondorf	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GnB---- Grenada	Moderate: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength.	Slight.
Ha---- Haymond	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
He---- Henshaw	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Moderate: low strength, floods, wetness.	Moderate: wetness.
Hs---- Huntington	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Hu:* Huntington-------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Robinsonville----	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Ka, Kc---- Karnak	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness.	Severe: too clayey, wetness.
Ld---- Lindside	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.	Moderate: too clayey, floods.
LoB---- Loring	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Severe: low strength.	Slight.
LoC---- Loring	Moderate: slope, wetness.	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MaC--- Markland	Severe: floods.	Severe: shrink-swell, floods.	Severe: shrink-swell, floods.	Severe: shrink-swell, slope, floods.	Severe: shrink-swell, low strength, floods.	Moderate: too clayey, slope, floods.
Md:*						
Markland---	Severe: slope, floods.	Severe: shrink-swell, slope, floods.	Severe: shrink-swell, slope, floods.	Severe: shrink-swell, slope, floods.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Collins---	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.	Moderate: floods.
Mg--- McGary	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
Mm, Mn--- Melvin	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness, low strength.	Severe: floods, wetness.
MoB--- Memphis	Slight---	Slight---	Slight---	Moderate: slope.	Moderate: low strength.	Slight.
MoC, MpC3--- Memphis	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
MpD3--- Memphis	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ne--- Newark	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Moderate: floods.
No--- Nolin	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.	Moderate: floods.
OtA, OtB--- Otwell	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Slight.
Pa--- Patton	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, low strength.	Severe: wetness.
Po--- Patton	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, low strength.	Severe: wetness.
Ro--- Robinsonville	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
SnE:*						
Steinsburg---	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Frondorf---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ud.* Udorthents						
UnA, UnB---------- Uniontown	Moderate: floods, wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: low strength.	Slight.
UoC3---------- Uniontown	Moderate: slope, floods, wetness.	Severe: floods.	Severe: floods.	Severe: slope, floods.	Moderate: slope, low strength.	Moderate: too clayey, slope.
Wa---------- Wakeland	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.	Moderate: floods. wetness.
Wb---------- Waverly	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness.
Wh---------- Weinbach	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness.	Slight.
WlC---------- Wellston	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
WlD---------- Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WpC3---------- Wellston	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
WpD3---------- Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WsA---------- Wheeling	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: low strength.	Slight.
WsB---------- Wheeling	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight.
WtC3---------- Wheeling	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
Wu---------- Wilbur	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Moderate: floods.	Severe: floods.	Severe: floods.
ZnC---------- Zanesville	Moderate: slope, too clayey, depth to rock.	Moderate: slope, wetness.	Moderate: slope, wetness. depth to rock.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
ZoC3---------- Zanesville	Moderate: slope, too clayey, depth to rock.	Moderate: slope, wetness.	Moderate: slope, wetness, depth to rock.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
As Ashton	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Bn Belknap	Severe: floods, wetness, percs slowly.	Severe: wetness, floods.	Severe: floods, wetness.	Severe: wetness, floods.	Poor: wetness.
Ca Calloway	Severe: percs slowly, wetness.	Slight	Moderate: wetness, percs slowly.	Moderate: wetness.	Good.
Co Collins	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Good.
Du.* Dumps					
FdE Frondorf	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer.
GnB Grenada	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey.
Ha Haymond	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
He Henshaw	Severe: wetness, percs slowly.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Hs Huntington	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
Hu:* Huntington	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
Robinsonville	Severe: floods.	Severe: floods, seepage.	Severe: seepage, floods.	Severe: seepage, floods.	Good.
Ka, Kc Karnak	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, wetness.
Ld Lindside	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
LoB Loring	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey.
LoC Loring	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, too clayey.	Moderate: slope, wetness.	Fair: slope, too clayey.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MaC---------- Markland	Severe: percs slowly, wetness, floods.	Severe: slope, floods.	Severe: too clayey, floods.	Severe: floods.	Poor: too clayey.
Md:* Markland----------	Severe: percs slowly, floods, wetness.	Severe: slope, floods.	Severe: too clayey, floods.	Severe: slope, floods.	Poor: too clayey.
Collins----------	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Good.
Mg---------- McGary	Severe: wetness, percs slowly.	Severe: floods.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, wetness.
Mm, Mn---------- Melvin	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
MoB---------- Memphis	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----------	Slight----------	Fair: too clayey.
MoC, MpC3---------- Memphis	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.	Fair: too clayey, slope.
MpD3---------- Memphis	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Ne---------- Newark	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
No---------- Nolin	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
OtA, OtB---------- Otwell	Severe: percs slowly, wetness.	Severe: floods.	Moderate: floods, wetness, too clayey.	Moderate: floods.	Fair: too clayey.
Pa---------- Patton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Po---------- Patton	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Ro---------- Robinsonville	Severe: floods.	Severe: floods, seepage.	Severe: seepage, floods.	Severe: seepage, floods.	Good.
SnE:* Steinsburg----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope.
Frondorf----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ud.* Udorthents					
UnA, UnB---------- Uniontown	Moderate: floods, percs slowly, wetness.	Severe: floods.	Severe: wetness.	Moderate: floods, wetness.	Good.
UoC3---------- Uniontown	Moderate: percs slowly, wetness, slope.	Severe: slope, floods.	Severe: wetness.	Moderate: slope, floods, wetness.	Fair: too clayey, slope.
Wa---------- Wakeland	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Wb---------- Waverly	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Wh---------- Weinbach	Severe: wetness, percs slowly.	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
WlC---------- Wellston	Severe: depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: slope, area reclaim.
WlD---------- Wellston	Severe: depth to rock, slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
WpC3---------- Wellston	Severe: depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: slope, area reclaim.
WpD3---------- Wellston	Severe: depth to rock, slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
WsA---------- Wheeling	Moderate: wetness, seepage.	Moderate: seepage, wetness.	Severe: seepage, wetness.	Moderate: wetness.	Good.
WsB---------- Wheeling	Moderate: wetness, seepage.	Moderate: slope, seepage, wetness.	Severe: seepage, wetness.	Moderate: wetness.	Good.
WtC3---------- Wheeling	Moderate: slope, wetness, seepage.	Severe: slope.	Severe: seepage, wetness.	Moderate: slope, wetness.	Fair: slope.
Wu---------- Wilbur	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: wetness.
ZnC, ZoC3---------- Zanesville	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: depth to rock.	Moderate: slope, wetness.	Fair: slope, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
As Ashton	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
Bn Belknap	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Ca Calloway	Fair: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Co Collins	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Du.* Dumps				
FdE Frondorf	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
GnB Grenada	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Ha Haymond	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
He Henshaw	Fair: low strength, wetness.	Poor: excess fines.	Poor: excess fines.	Fair: thin layer.
Hs Huntington	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Hu:* Huntington	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Robinsonville	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
Ka, Kc Karnak	Poor: low strength, wetness, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
Ld Lindside	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
LoB Loring	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
LoC Loring	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
MaC Markland	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Md:* Markland	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Md:* Collins	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Mg McGary	Poor: shrink-swell, low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Mm, Mn Melvin	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
MoB Memphis	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
MoC, MpC3 Memphis	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
MpD3 Memphis	Fair: low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Ne Newark	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
No Nolin	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
OtA, OtB Otwell	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Pa, Po Patton	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Ro Robinsonville	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
SnE:* Steinsburg	Poor: slope, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Frondorf	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Ud.* Udorthents				
UnA, UnB Uniontown	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
UoC3 Uniontown	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey.
Wa Wakeland	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Wb Waverly	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Wh Weinbach	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
W1C---------- Wellston	Fair: low strength, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
W1D---------- Wellston	Fair: low strength, slope, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
WpC3---------- Wellston	Fair: low strength, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, slope.
WpD3---------- Wellston	Fair: low strength, slope, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
WsA, WsB---------- Wheeling	Fair: low strength.	Unsuited: excess fines.	Fair: excess fines.	Good.
WtC3---------- Wheeling	Fair: low strength.	Unsuited: excess fines.	Fair: excess fines.	Fair: slope, too clayey.
Wu---------- Wilbur	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
ZnC, ZoC3---------- Zanesville	Fair: low strength, wetness.	Poor: excess fines.	Poor: excess fines.	Fair: slope, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Terraces and diversions	Grassed waterways
As---- Ashton	Moderate: seepage.	Severe: piping.	Deep to water----	Erodes easily----	Erodes easily.
Bn---- Belknap	Moderate: seepage.	Moderate: piping, wetness.	Floods----------	Wetness, erodes easily.	Wetness, erodes easily.
Ca---- Calloway	Slight----------	Severe: piping.	Percs slowly-----	Percs slowly, erodes easily, piping.	Percs slowly, erodes easily, slope.
Co---- Collins	Moderate: seepage.	Moderate: piping, wetness.	Floods----------	Erodes easily, wetness.	Erodes easily.
Du.* Dumps					
FdE---- Frondorf	Severe: slope.	Severe: piping.	Deep to water----	Depth to rock, slope.	Slope, depth to rock.
GnB---- Grenada	Slight----------	Severe: piping.	Slope, percs slowly.	Percs slowly, rooting depth.	Erodes easily, rooting depth. percs slowly.
Ha---- Haymond	Moderate: seepage.	Severe: piping.	Deep to water----	Erodes easily----	Erodes easily.
He---- Henshaw	Slight----------	Severe: wetness, piping.	Favorable--------	Erodes easily, wetness.	Wetness, erodes easily.
Hs---- Huntington	Moderate: seepage.	Severe: piping.	Deep to water----	Erodes easily----	Erodes easily.
Hu:* Huntington-------	Moderate: seepage.	Severe: piping.	Deep to water----	Erodes easily----	Erodes easily.
Robinsonville----	Severe: seepage.	Severe: piping.	Deep to water----	Favorable--------	Favorable.
Ka, Kc---------- Karnak	Slight----------	Severe: hard to pack.	Percs slowly-----	Wetness, percs slowly.	Wetness, percs slowly.
Ld---- Lindside	Moderate: seepage.	Severe: piping.	Floods----------	Wetness----------	Favorable.
LoB, LoC---------- Loring	Moderate: seepage.	Moderate: piping.	Slope----------	Erodes easily, slope, wetness.	Rooting depth, erodes easily, slope.
MaC---- Markland	Slight----------	Moderate: hard to pack.	Deep to water----	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Md:* Markland---------	Slight----------	Moderate: hard to pack.	Deep to water----	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Terraces and diversions	Grassed waterways
Md:* Collins	Moderate: seepage.	Moderate: piping, wetness.	Floods	Erodes easily, wetness.	Erodes easily.
Mg McGary	Slight	Hard to pack, wetness.	Percs slowly	Percs slowly, wetness, erodes easily.	Percs slowly, wetness, erodes easily.
Mm, Mn Melvin	Moderate: seepage.	Severe: wetness.	Floods	Erodes easily, wetness.	Wetness, erodes easily.
MoB, MoC, MpC3, MpD3 Memphis	Moderate: seepage.	Moderate: piping.	Deep to water	Erodes easily, slope.	Erodes easily, slope.
Ne Newark	Moderate: seepage.	Severe: wetness, piping.	Floods	Wetness, erodes easily.	Wetness, erodes easily.
No Nolin	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.
OtA, OtB Otwell	Slight	Moderate: piping.	Slope, seepage.	Erodes easily, rooting depth, percs slowly.	Erodes easily, rooting depth, percs slowly.
Pa Patton	Moderate: seepage.	Severe: wetness.	Favorable	Wetness	Wetness.
Po Patton	Moderate: seepage.	Severe: wetness.	Floods	Wetness	Wetness.
Ro Robinsonville	Severe: seepage.	Severe: piping, seepage.	Deep to water	Favorable	Favorable.
SnE:* Steinsburg	Severe: slope, seepage.	Moderate: piping.	Deep to water	Slope, depth to rock, rooting depth.	Droughty, slope.
Frondorf	Severe: slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.
Ud.* Udorthents					
UnA, UnB Uniontown	Moderate: seepage.	Severe: piping.	Slope	Erodes easily	Erodes easily.
UoC3 Uniontown	Moderate: seepage.	Severe: piping.	Slope	Erodes easily	Erodes easily, slope.
Wa Wakeland	Moderate: seepage.	Severe: piping,	Floods	Erodes easily wetness.	Wetness, erodes easily.
Wb Waverly	Moderate: seepage.	Severe: wetness.	Floods	Wetness, erodes easily.	Wetness, erodes easily.
Wh Weinbach	Slight	Moderate: piping.	Percs slowly	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Terraces and diversions	Grassed waterways
W1C, W1D, WpC3, WpD3---------- Wellston	Moderate: seepage.	Severe: piping.	Deep to water----	Slope, erodes easily.	Erodes easily, slope.
WsA, WsB, WtC3---- Wheeling	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water----	Slope----------	Slope.
Wu---------- Wilbur	Moderate: seepage.	Moderate: piping.	Deep to water----	Erodes easily----	Erodes easily.
ZnC, ZoC3--------- Zanesville	Moderate: depth to rock, seepage.	Moderate: piping. wetness.	Percs slowly, slope.	Slope, rooting depth, erodes easily.	Erodes easily, slope, rooting depth.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
As---------- Ashton	0-9	Silt loam-------	ML, CL	A-4	0	95-100	90-100	75-100	60-95	<35	NP-10
	9-58	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	75-100	25-42	5-20
	58-64	Silt loam, loam, fine sandy loam.	ML, CL, SM, CL-ML	A-4, A-6	0-5	90-100	85-100	65-95	40-90	<40	NP-20
Bn---------- Belknap	0-9	Silt loam-------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	80-100	21-29	2-8
	9-60	Silt loam-------	ML, CL-ML, CL	A-4, A-6	0	100	95-100	90-100	80-100	22-32	NP-12
Ca---------- Calloway	0-21	Silt loam-------	CL-ML, CL	A-4, A-6	0	100	100	100	90-100	25-35	5-15
	21-61	Silt loam, silty clay loam.	CL	A-6	0	100	100	100	90-95	30-40	12-20
Co---------- Collins	0-9	Silt loam-------	ML, CL, CL-ML	A-4	0	100	100	85-100	70-90	<30	NP-8
	9-60	Silt loam, silt	ML, CL-ML	A-4	0	100	100	100	90-100	<35	NP-10
Du.* Dumps											
FdE---------- Frondorf	0-14	Silt loam-------	ML, CL, CL-ML	A-4	0-5	90-100	90-100	85-100	75-100	25-35	5-10
	14-28	Channery silty clay loam, silty clay loam, channery silty clay.	ML, CL, GM, GC	A-4, A-6, A-2, A-7	10-40	55-90	50-85	40-80	30-75	<45	NP-25
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GnB---------- Grenada	0-6	Silt loam-------	ML, CL-ML	A-4	0	100	100	95-100	90-100	<30	NP-6
	6-22	Silt loam, silty clay loam.	CL	A-6, A-4	0	100	100	95-100	90-100	27-40	8-19
	22-24	Silt loam-------	CL-ML, CL	A-4	0	100	100	95-100	90-100	20-30	5-10
	24-48	Silt loam, silty clay loam.	CL, ML	A-6, A-5, A-7, A-4	0	100	100	95-100	90-100	25-45	5-24
	48-60	Silt loam, silty clay loam.	CL, ML	A-6, A-5, A-7, A-4	0	100	100	95-100	90-100	25-45	5-24
Ha---------- Haymond	0-9	Silt loam-------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	9-60	Silt loam-------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
He---------- Henshaw	0-12	Silt loam-------	ML, CL, CL-ML	A-4	0	95-100	95-100	90-100	80-100	20-35	3-10
	12-44	Silty clay loam, silt loam.	CL, ML	A-6, A-4	0	95-100	95-100	95-100	85-100	30-40	8-18
	44-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-15
Hs---------- Huntington	0-9	Silt loam-------	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-35	5-15
	9-42	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-35	5-15
	42-60	Stratified sandy clay loam to loam.	SM, SC, ML, CL	A-2, A-4	0	95-100	60-100	50-90	30-75	<30	NP-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Hu:*											
Huntington	0-9	Silt loam	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-35	5-15
	9-42	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-35	5-15
	42-60	Stratified sandy clay loam to loam.	SM, SC, ML, CL	A-2, A-4	0	95-100	60-100	50-90	30-75	<30	NP-10
Robinsonville	0-10	Fine sandy loam	SM, ML	A-4	0	100	95-100	85-95	35-80	<25	NP-3
	10-70	Stratified fine sandy loam to silt loam.	SM, ML	A-4	0	100	95-100	75-95	35-65	<25	NP-3
Ka Karnak	0-11	Silt loam	ML, CL, CL-ML	A-4	0	100	100	90-100	70-90	<30	NP-8
	11-60	Silty clay, clay	CH, MH, CL	A-7	0	100	100	95-100	95-100	45-80	23-38
Kc Karnak	0-9	Silty clay	CH, CL, MH	A-7	0	100	100	95-100	95-100	45-80	25-45
	9-60	Silty clay, clay	CH, MH, CL	A-7	0	100	100	95-100	95-100	45-80	23-38
Ld Lindside	0-10	Silty clay loam	CL, CL-ML	A-6	0	100	95-100	90-100	80-95	25-40	10-15
	10-46	Silty clay loam, silt loam.	CL, ML	A-4, A-6	0	100	95-100	80-100	55-95	25-40	2-20
	46-60	Silt loam, silty clay loam, loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	80-100	60-95	20-45	1-25
LoB, LoC Loring	0-7	Silt loam	ML, CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	19-35	NP-15
	7-31	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	100	95-100	90-100	20-45	8-27
	31-50	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	90-100	25-45	8-24
	50-60	Silt loam	CL, ML	A-4, A-6, A-7	0	100	100	95-100	70-100	28-45	8-24
MaC Markland	0-7	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
	7-44	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	44-60	Stratified clay to silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	75-95	35-60	20-35
Md:*											
Markland	0-5	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	5-44	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	44-60	Stratified clay to silty clay loam.	CL, CH	A-6, A-7	0	100	100	90-100	75-95	35-60	20-35
Collins	0-9	Silt loam	ML, CL, CL-ML	A-4	0	100	100	85-100	70-90	<30	NP-8
	9-60	Silt loam, silt	ML, CL-ML	A-4	0	100	100	100	90-100	<35	NP-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Mg McGary	0-6	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-36	5-15
	6-41	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-100	46-58	24-32
	41-60	Stratified silty clay to clay.	CL, CH	A-6, A-7	0	95-100	95-100	95-100	85-100	38-54	20-32
Mm, Mn Melvin	0-9	Silty clay loam	CL	A-6, A-7	0	95-100	90-100	80-100	80-95	35-42	15-22
	9-38	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	80-95	25-40	5-20
	38-60	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6	0	85-100	80-100	70-100	60-95	25-40	5-20
MoB, MoC Memphis	0-6	Silt loam	ML, CL-ML, CL	A-4	0	100	100	100	90-100	<30	NP-10
	6-43	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	90-100	35-48	15-25
	43-60	Silt loam	ML, CL	A-4, A-6	0	100	100	100	90-100	30-40	6-15
MpC3, MpD3 Memphis	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
	7-43	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	90-100	35-48	15-25
	43-60	Silt loam	ML, CL	A-4, A-6	0	100	100	100	90-100	30-40	6-15
Ne Newark	0-8	Silty clay loam	CL	A-6	0	95-100	90-100	85-100	80-95	30-40	11-20
	8-43	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	70-95	22-42	4-20
	43-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-3	75-100	70-100	65-100	55-95	22-42	4-20
No Nolin	0-10	Silty clay loam	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	10-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23
OtA, OtB Otwell	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	8-23	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-20
	23-45	Silty clay loam, loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	85-100	65-90	35-50	15-30
	45-60	Stratified silt loam to silty clay.	CL	A-6, A-7	0	95-100	75-100	75-100	75-95	35-50	15-30
Pa, Po Patton	0-23	Silt loam	ML, CL-ML	A-7	0	100	100	95-100	75-95	25-40	5-14
	23-42	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	80-100	40-55	15-25
	42-60	Stratified silt loam to silty clay loam.	CL	A-6	0	100	100	95-100	75-95	25-40	10-20
Ro Robinsonville	0-10	Fine sandy loam	SM, ML	A-4	0	100	95-100	75-90	35-80	<25	NP-3
	10-60	Stratified fine sandy loam to loamy fine sand.	SM, ML	A-4	0	100	95-100	70-90	35-65	<25	NP-3

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SnE:*											
Steinsburg	0-5	Loam	ML, SM	A-4	0-5	95-100	90-100	65-90	35-70	---	---
	5-19	Loam, gravelly sandy loam, fine sandy loam.	SM, SM-SC	A-2, A-4, A-1	0-10	75-95	65-85	35-60	15-40	<25	NP-5
	19-27	Gravelly fine sandy loam.	SM, GM	A-2, A-1	5-20	55-70	50-70	35-60	15-35	<25	NP-3
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Frondorf	0-14	Silt loam	ML, CL, CL-ML	A-4	0-5	90-100	90-100	85-100	75-100	25-35	5-10
	14-28	Channery silty clay loam, channery silt loam, channery silty clay.	ML, CL, GM, GC	A-4, A-6, A-2, A-7	10-40	55-90	50-85	40-80	30-75	<45	NP-25
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ud.*											
Udorthents											
UnA, UnB	0-8	Silt loam	ML, CL-ML	A-4	0	100	95-100	90-100	80-100	20-35	2-10
Uniontown	8-34	Silt loam, silty clay loam.	CL, ML	A-6, A-4, A-7	0	100	95-100	90-100	85-100	29-45	7-20
	34-60	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	90-100	90-100	85-100	75-100	30-45	7-20
UoC3	0-8	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	85-100	35-45	15-22
Uniontown	8-31	Silt loam, silty clay loam.	CL, ML	A-6, A-4, A-7	0	100	95-100	90-100	85-100	29-45	7-20
	31-60	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	90-100	90-100	85-100	75-100	30-45	7-20
Wa	0-11	Silt loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
Wakeland	11-60	Silt loam	ML, CL-ML	A-4	0	100	100	90-100	80-100	24-36	4-10
Wb	0-8	Silt loam	ML, CL	A-4	0	100	100	90-100	65-95	<25	NP-9
Waverly	8-62	Silt, silt loam	ML, CL	A-4	0	100	100	95-100	85-100	20-30	4-10
Wh	0-9	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-40	5-15
Weinbach	9-20	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	70-90	25-35	8-15
	20-49	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6, A-7	0	100	100	90-100	70-90	25-42	8-20
	49-63	Stratified silty clay loam to fine sand.	CL, ML, SM, SC	A-6, A-7, A-2, A-4	0	100	100	90-100	20-95	25-45	NP-20
W1C, W1D	0-7	Silt loam	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
Wellston	7-34	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	34-59	Silt loam, loam, channery sandy clay loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	59	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WpC3---------- Wellston	0-6	Silty clay loam	CL	A-6	0-5	95-100	90-100	85-100	75-95	30-40	10-20
	6-31	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	31-46	Silt loam, loam, channery sandy clay loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WpD3---------- Wellston	0-7	Silty clay loam	CL	A-6	0-5	95-100	90-100	85-100	75-95	30-40	10-20
	7-31	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	31-46	Silt loam, loam, channery sandy clay loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WsA, WsB---------- Wheeling	0-9	Silt loam-------	ML, CL, SM	A-4, A-6, A-7	0	90-100	90-100	85-100	45-90	20-50	1-25
	9-65	Silty clay loam, loam, fine sandy loam.	ML, CL	A-4, A-6, A-7	0-5	90-100	70-100	65-100	50-80	20-50	1-25
WtC3---------- Wheeling	0-7	Silty clay loam	CL	A-4, A-6, A-7	0	90-100	90-100	85-100	60-90	30-45	10-25
	7-65	Silty clay loam, loam, sandy loam.	ML, CL, SM	A-4, A-6, A-7	0-5	90-100	70-100	65-100	45-80	20-50	1-25
Wu---------- Wilbur	0-9	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	9-60	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
ZnC---------- Zanesville	0-6	Silt loam-------	CL-ML, CL, ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	4-15
	6-30	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	30-47	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	80-100	60-100	20-40	2-20
	47-69	Sandy clay loam, clay loam, channery silty clay loam.	SC, CL, SM, GM	A-6, A-4, A-2, A-1-B	0-10	65-100	50-95	40-95	20-85	20-40	2-20
	69	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ZoC3---------- Zanesville	0-6	Silty clay loam	CL	A-6	0	95-100	95-100	90-100	80-100	30-40	10-20
	6-26	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	26-41	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	80-100	60-100	20-40	2-20
	41-63	Sandy clay loam, clay loam, channery silty clay loam.	SC, CL, SM, GM	A-6, A-4, A-2, A-1-B	0-10	65-100	50-95	40-95	20-85	20-40	2-20
	63	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than. Entries under "Erosion factors--T" apply to the entire profile. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
As	0-9	0.6-2.0	0.16-0.23	5.6-7.3	Low	0.28	4
Ashton	9-58	0.6-2.0	0.18-0.23	5.6-7.3	Low	0.43	
	58-64	0.6-2.0	0.14-0.20	5.6-7.3	Low	0.43	
Bn	0-9	0.2-2.0	0.22-0.24	4.5-7.3	Low	0.37	5
Belknap	9-60	0.2-2.0	0.20-0.22	4.5-6.0	Low	0.37	
Ca	0-21	0.6-2.0	0.20-0.23	4.5-5.5	Low	0.49	3
Calloway	21-61	0.06-0.2	0.09-0.12	4.5-5.5	Moderate	0.43	
Co	0-9	0.6-2.0	0.16-0.24	4.5-5.5	Low	0.43	5
Collins	9-60	0.6-2.0	0.20-0.24	4.5-5.5	Low	0.43	
Du.*							
Dumps							
FdE	0-14	0.6-2.0	0.18-0.22	4.5-5.5	Low	0.32	3
Frondorf	14-28	0.6-2.0	0.08-0.16	4.5-5.5	Low	0.17	
	28	---	---	---	---	---	
GnB	0-6	0.6-2.0	0.20-0.23	4.5-5.5	Low	0.43	3
Grenada	6-22	0.6-2.0	0.20-0.23	4.5-5.5	Low	0.43	
	22-24	0.6-2.0	0.20-0.23	4.5-5.5	Low	0.43	
	24-48	0.06-0.2	0.10-0.12	4.5-5.5	Low	0.37	
	48-60	0.06-0.2	0.10-0.12	5.1-5.5	Low	0.37	
Ha	0-9	0.6-2.0	0.22-0.24	6.1-7.3	Low	0.37	5
Haymond	9-60	0.6-2.0	0.20-0.22	6.1-7.3	Low	0.37	
He	0-12	0.6-2.0	0.18-0.23	5.6-6.5	Low	0.43	4
Henshaw	12-44	0.2-0.6	0.15-0.19	5.1-6.5	Low	0.43	
	44-60	0.2-0.6	0.17-0.22	6.6-8.4	Low	0.43	
Hs	0-9	0.6-2.0	0.18-0.24	6.1-7.8	Low	0.32	5
Huntington	9-42	0.6-2.0	0.10-0.16	6.1-7.8	Low	0.32	
	42-60	0.6-2.0	0.10-0.16	6.1-7.8	Low	0.32	
Hu:*							
Huntington	0-9	0.6-2.0	0.18-0.24	6.1-7.8	Low	0.32	5
	9-42	0.6-2.0	0.10-0.16	6.1-7.8	Low	0.32	
	42-60	0.6-2.0	0.10-0.16	6.1-7.8	Low	0.32	
Robinsonville	0-10	2.0-6.0	0.15-0.22	6.1-8.4	Low	0.32	5
	10-70	0.6-6.0	0.14-0.18	6.1-8.4	Low	0.32	
Ka	0-11	0.06-0.2	0.11-0.14	5.6-7.8	High	0.32	3
Karnak	11-60	<0.2	0.09-0.13	5.6-7.8	High	0.32	
Kc	0-9	0.06-0.2	0.11-0.14	5.6-7.8	High	0.32	3
Karnak	9-60	<0.2	0.09-0.13	5.6-7.8	High	0.32	
Ld	0-10	0.6-2.0	0.17-0.22	5.6-7.8	Low	0.28	3
Lindside	10-46	0.6-2.0	0.17-0.22	5.6-6.5	Low	0.28	
	46-60	0.2-2.0	0.12-0.18	5.6-6.5	Low	0.43	
LoB, LoC	0-7	0.6-2.0	0.20-0.23	4.5-7.3	Low	0.43	3
Loring	7-31	0.6-2.0	0.20-0.22	4.5-5.5	Low	0.43	
	31-50	0.2-0.6	0.06-0.13	4.5-5.5	Low	0.43	
	50-60	0.6-2.0	0.06-0.13	4.5-5.5	Low	0.43	
MaC	0-7	0.2-0.6	0.18-0.20	5.1-7.3	Moderate	0.43	2
Markland	7-44	0.06-0.2	0.11-0.13	5.1-8.4	High	0.32	
	44-60	0.06-0.2	0.09-0.11	7.9-8.4	High	0.32	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
Md:*							
Markland	0-5	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.43	3
	5-44	0.06-0.2	0.11-0.13	5.1-8.4	High	0.32	
	44-60	0.06-0.2	0.09-0.11	7.9-8.4	High	0.32	
Collins	0-9	0.6-2.0	0.16-0.24	4.5-5.5	Low	0.43	5
	9-60	0.6-2.0	0.20-0.24	4.5-5.5	Low	0.43	
Mg	0-6	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.43	3
McGary	6-41	<0.2	0.11-0.13	4.5-6.0	High	0.32	
	41-60	<0.2	0.14-0.16	6.6-8.4	High	0.32	
Mm, Mn	0-9	0.6-2.0	0.18-0.23	5.6-7.8	Low	0.43	5
Melvin	9-38	0.6-2.0	0.18-0.23	5.6-7.3	Low	0.43	
	38-60	0.6-2.0	0.16-0.23	6.1-7.3	Low	0.43	
MoB, MoC	0-6	0.6-2.0	0.20-0.23	4.5-7.3	Low	0.37	5
Memphis	6-43	0.6-2.0	0.20-0.22	4.5-6.0	Low	0.37	
	43-60	0.6-2.0	0.20-0.23	4.5-6.0	Low	0.37	
MpC3, MpD3	0-7	0.6-2.0	0.20-0.23	4.5-7.3	Low	0.37	5
Memphis	7-43	0.6-2.0	0.20-0.22	4.5-6.0	Low	0.37	
	43-60	0.6-2.0	0.20-0.23	4.5-6.0	Low	0.37	
Ne	0-8	0.6-2.0	0.18-0.22	5.6-7.8	Low	0.43	5
Newark	8-43	0.6-2.0	0.18-0.23	5.6-7.8	Low	0.43	
	43-60	0.6-2.0	0.15-0.22	5.6-7.8	Low	0.43	
No	0-10	0.6-2.0	0.18-0.23	5.6-7.8	Low	0.43	5
Nolin	10-60	0.6-2.0	0.18-0.23	5.6-7.8	Low	0.43	
OtA, OtB	0-8	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.43	3
Otwell	8-23	0.6-2.0	0.18-0.22	4.5-5.5	Moderate	0.43	
	23-45	0.06-0.2	0.06-0.08	4.5-5.5	Moderate	0.43	
	45-60	0.06-0.2	0.06-0.08	5.1-6.0	Moderate	0.43	
Pa, Po	0-23	0.6-2.0	0.21-0.23	6.6-7.3	Low	0.28	5
Patton	23-42	0.6-2.0	0.18-0.20	6.1-7.8	Moderate	0.28	
	42-60	0.6-2.0	0.18-0.22	7.4-8.4	Moderate	0.28	
Ro	0-10	2.0-6.0	0.15-0.22	6.1-8.4	Low	0.32	5
Robinsonville	10-60	0.6-6.0	0.14-0.18	6.1-8.4	Low	0.32	
SnE:*							
Steinsburg	0-5	2.0-6.0	0.10-0.14	4.5-5.5	Low	0.28	2
	5-19	2.0-6.0	0.10-0.14	4.5-5.5	Low	0.28	
	19-27	2.0-6.0	0.04-0.08	4.5-5.5	Low	0.28	
	27	---	---	---	---	---	
Frondorf	0-14	0.6-2.0	0.18-0.22	4.5-5.5	Low	0.32	3
	14-28	0.6-2.0	0.08-0.16	4.5-5.5	Low	0.17	
	28	---	---	---	---	---	
Ud.*							
Udorthents							
UnA, UnB	0-8	0.6-2.0	0.19-0.33	5.1-7.3	Low	0.37	4
Uniontown	8-34	0.6-2.0	0.18-0.22	5.1-6.5	Low	0.37	
	34-60	0.2-2.0	0.18-0.22	6.6-8.4	Low	0.37	
UoC3	0-8	0.6-2.0	0.18-0.22	5.1-7.3	Low	0.37	3
Uniontown	8-31	0.6-2.0	0.18-0.22	5.1-6.5	Low	0.37	
	31-60	0.2-2.0	0.18-0.22	6.6-8.4	Low	0.37	
Wa	0-11	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5
Wakeland	11-60	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
Wb	0-8	0.6-2.0	0.20-0.22	4.5-5.5	Low	0.43	3
Waverly	8-62	0.6-2.0	0.20-0.22	4.5-5.5	Low	0.43	
Wh	0-9	0.6-2.0	0.20-0.24	4.5-7.3	Low	0.43	4
Weinbach	9-20	0.6-2.0	0.20-0.22	4.5-5.5	Low	0.43	
	20-49	<0.06	0.06-0.08	4.5-5.5	Low	0.43	
	49-63	0.2-0.6	0.19-0.21	4.5-5.5	Low	0.43	
W1C, W1D	0-7	0.6-2.0	0.18-0.22	4.5-6.5	Low	0.37	4
Wellston	7-34	0.6-2.0	0.17-0.21	4.5-5.5	Low	0.37	
	34-59	0.6-2.0	0.12-0.17	4.5-5.5	Low	0.37	
	59	---	---	---	---	---	
WpC3	0-6	0.6-2.0	0.17-0.21	4.5-6.5	Low	0.37	3
Wellston	6-31	0.6-2.0	0.17-0.21	4.5-5.5	Low	0.37	
	31-46	0.6-2.0	0.12-0.17	4.5-5.5	Low	0.37	
	46	---	---	---	---	---	
WpD3	0-7	0.6-2.0	0.17-0.21	4.5-6.5	Low	0.37	3
Wellston	7-31	0.6-2.0	0.17-0.21	4.5-5.5	Low	0.37	
	31-46	0.6-2.0	0.12-0.17	4.5-5.5	Low	0.37	
	46	---	---	---	---	---	
WsA, WsB	0-9	0.6-7.3	0.12-0.18	5.1-7.3	Low	0.32	4
Wheeling	9-65	0.6-2.0	0.08-0.12	5.1-6.0	Low	0.28	
WtC3	0-7	0.6-6.0	0.12-0.18	5.1-7.3	Low	0.32	4
Wheeling	7-65	0.6-2.0	0.08-0.12	5.1-6.0	Low	0.28	
Wu	0-9	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5
Wilbur	9-60	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37	
ZnC	0-6	0.6-2.0	0.19-0.23	4.5-5.5	Low	0.37	3
Zanesville	6-30	0.6-2.0	0.17-0.22	4.5-5.5	Low	0.37	
	30-47	0.06-0.6	0.08-0.12	4.5-5.5	Low	0.37	
	47-69	0.2-2.0	0.08-0.12	4.5-5.5	Low	0.28	
	69	---	---	---	---	---	
ZoC3	0-6	0.6-2.0	0.18-0.23	4.5-5.5	Low	0.37	3
Zanesville	6-26	0.6-2.0	0.17-0.22	4.5-5.5	Low	0.37	
	26-41	0.06-0.6	0.08-0.12	4.5-5.5	Low	0.37	
	41-63	0.2-2.0	0.08-0.12	4.5-5.5	Low	0.28	
	63	---	---	---	---	---	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

[The Glossary explains terms such as "rare," "brief," "apparent," and "perched." The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
As---- Ashton	B	Occasional	Very brief	Jan-Apr	>6.0	---	---	>60	---	Low----	Low.
Bn---- Belknap	C	Occasional	Long----	Dec-May	1.0-3.0	Apparent	Dec-May	>60	---	High----	High.
Ca---- Calloway	C	None----	---	---	1.0-2.0	Perched	Dec-May	>60	---	High----	Moderate.
Co---- Collins	C	Occasional	Brief to very long.	Dec-May	2.0-5.0	Apparent	Dec-May	>60	---	Moderate	Moderate.
Du.* Dumps											
FdE---- Frondorf	B	None----	---	---	>6.0	---	---	20-40	Rippable	Moderate	High.
GnB---- Grenada	C	None----	---	---	1.5-2.5	Perched	Jan-Apr	>60	---	Moderate	Moderate.
Ha---- Haymond	B	Occasional	Brief----	Dec-May	>6.0	---	---	>60	---	Low----	Low.
He---- Henshaw	C	Rare----	---	---	1.0-2.0	Apparent	Dec-May	>60	---	High----	Moderate.
Hs---- Huntington	B	Occasional	Brief----	Dec-May	3.0-6.0	Apparent	Dec-Apr	>60	---	Low----	Moderate.
Hu:*											
Huntington----	B	Occasional	Brief----	Dec-May	3.0-6.0	Apparent	Dec-Apr	>60	---	Low----	Moderate.
Robinsonville----	B	Occasional	Brief----	Dec-May	4.0-6.0	Apparent	Jan-Apr	>60	---	Low----	Low.
Ka, Kc---- Karnak	D	Rare----	---	---	0-3.0	Apparent	Dec-May	>60	---	High----	Moderate.
Ld---- Lindside	C	Occasional	Very brief	Dec-May	1.5-3.0	Apparent	Dec-Apr	>60	---	Moderate	Low.
LoB, LoC---- Loring	C	None----	---	---	2.0-3.0	Perched	Jan-Mar	>60	---	Moderate	Moderate.
MaC---- Markland	C	Occasional	Brief----	Dec-Apr	3.0-6.0	Perched	Jan-Apr	>60	---	High----	Moderate.
Md:*											
Markland----	C	Occasional	Brief----	Dec-Apr	3.0-6.0	Perched	Jan-Apr	>60	---	High----	Moderate.
Collins----	C	Occasional	Brief to very long.	Dec-May	2.0-5.0	Apparent	Dec-May	>60	---	Moderate	Moderate.
Mg---- McGary	C	Rare----	---	---	1.0-3.0	Apparent	Dec-Apr	>60	---	High----	Low.
Mm---- Melvin	D	Occasional	Brief----	Dec-May	0.0-1.0	Apparent	Dec-May	>60	---	High----	Low.
Mn---- Melvin	D	Frequent----	Brief----	Dec-May	0.0-1.0	Apparent	Dec-May	>60	---	High----	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
MoB, MoC, MpC3, MpD3---------- Memphis	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Ne---------- Newark	C	Occasional	Brief-----	Dec-May	0.5-1.5	Apparent	Dec-May	>60	---	High-----	Low.
No---------- Nolin	B	Occasional	Brief to long.	Dec-May	3.0-6.0	Apparent	Dec-Apr	>60	---	Low------	Moderate.
OtA, OtB---------- Otwell	C	Rare--------	---	---	1.5-3.0	Perched	Jan-Apr	>60	---	Moderate	High.
Pa---------- Patton	B/D	Rare--------	---	---	0.0-2.0	Apparent	Dec-May	>60	---	High-----	Low.
Po---------- Patton	B/D	Occasional	Brief-----	Dec-May	0.0-2.0	Apparent	Dec-May	>60	---	High-----	Low.
Ro---------- Robinsonville	B	Occasional	Brief-----	Dec-May	4.0-6.0	Apparent	Dec-Apr	>60	---	Low------	Low.
SnE:* Steinsburg-------	C	None--------	---	---	>6.0	---	---	24-40	Ripable	Low------	High.
Frondorf---------	B	None--------	---	---	>6.0	---	---	20-40	Ripable	Moderate	High.
Ud.* Udorthents											
UnA, UnB, UoC3---- Uniontown	B	Rare--------	---	---	2.5-6.0	Apparent	Dec-May	>60	---	Low------	Moderate.
Wa---------- Wakeland	B/D	Occasional	Brief-----	Dec-May	1.0-3.0	Apparent	Dec-May	>60	---	High-----	Low.
Wb---------- Waverly	B/D	Occasional	Brief to long.	Dec-May	0.5-1.0	Apparent	Dec-May	>60	---	High-----	Moderate.
Wh---------- Weinbach	C	Rare--------	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High-----	High.
WlC, WlD, WpC3, WpD3---------- Wellston	B	None--------	---	---	>6.0	---	---	>40	Hard	Moderate	High.
WsA, WsB, WtC3---- Wheeling	B	None--------	---	---	4.0-6.0	Apparent	Jan-Apr	>60	---	Low------	Moderate.
Wu---------- Wilbur	C	Occasional--	Brief-----	Dec-May	3.0-6.0	Apparent	Jan-Apr	>60	---	Moderate	Moderate.
ZnC, ZoC3---------- Zanesville	C	None--------	---	---	2.0-3.0	Perched	Jan-Apr	40-80	Hard	Moderate	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution									Liquid limit	Plasticity index	Moisture density		California bearing ratio
			Percentage passing sieve--						Percentage smaller than--							
	AASHTO	Unified	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Max. dry density	Optimum moisture	
												Pct		Lb/Ft^3	Pct	Pct
Belknap sil:[1] (S73KY-117-002)																
B22g-----18 to 46	A-6 (09)	CL	100	100	100	100	99	94	60	21	13	25	12	101	17	30
Grenada sil:[2] (S73KY-117-005)																
B22------12 to 22	A-6 (15)	CL	100	100	100	100	99	97	72	33	26	34	15	102	18	23
Bx-------25 to 52	A-4 (08)	ML	100	100	100	100	100	99	69	29	23	34	7	105	17	4
Cx-------52 to 68	A-4 (06)	ML	100	100	100	100	99	91	68	44	32	31	6	109	16	7
Karnak sic:[3] (S73KY-117-003)																
B1g------ 7 to 26	A-7-6(31)	CH	100	100	100	100	100	97	83	62	53	53	28	98	21	4
B2g------26 to 44	A-7-6(36)	CH	100	100	100	100	100	98	82	68	56	53	33	99	22	2
Cg-------44 to 73	A-7-6(31)	CL	100	100	100	100	99	98	81	62	48	48	29	103	19	3
Loring sil:[4] (S73KY-117-004)																
B2t------ 9 to 29	A-6 (19)	CL	100	100	100	100	100	100	72	35	28	37	18	104	17	24
Bx-------29 to 59	A-6 (15)	CL	100	100	100	100	100	99	67	28	20	37	14	101	17	15
C--------59 to 73	A-6 (18)	CL	100	100	100	100	100	93	48	21	18	38	19	116	13	13
McGary sil:[5] (S73KY-117-001)																
B23t-----20 to 40	A-7-6(36)	CH	100	100	100	100	100	99	86	70	58	56	32	99	23	2
C--------52 to 72	A-7-6(24)	CL	100	99	99	99	99	97	82	68	52	44	23	103	20	2
Memphis sil:[6] (S73KY-113-001)																
B2t------14 to 44	A-6 (18)	CL	100	100	100	100	100	100	69	34	28	39	16	103	20	10
C--------52 to 78	A-6 (12)	CL	100	100	100	100	100	100	59	20	18	31	12	106	14	17
Nolin sicl:[7] (S73KY-113-004)																
B2-------18 to 43	A-7-6(26)	CL	100	100	100	100	100	99	77	46	33	46	23	96	23	5
Uniontown sil:[8] (S73KY-113-002)																
B22t-----19 to 33	A-4 (08)	CL	100	100	100	100	100	99	63	18	14	29	8	103	20	10
C1-------38 to 52	A-6 (14)	CL	100	100	100	100	99	97	68	32	26	36	14	106	14	17

See footnotes at end of table.

TABLE 17.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution									Liquid limit	Plasticity index	Moisture density		California bearing ratio
			Percentage passing sieve--						Percentage smaller than--							
	AASHTO	Unified	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Max. dry density	Optimum moisture	
												Pct		Lb/Ft^3	Pct	Pct
Wakeland sil:[9] (S73KY-113-003)																
C2g------16 to 40	A-4 (03)	CL-ML	100	100	100	100	99	98	60	22	13	24	5	104	--	0

[1] Belknap silt loam
1 mile west of U.S. Highway 41a, 0.5 mile south on Kentucky Highway 270, 100 feet west of unsurfaced road.

[2] Grenada silt loam
900 feet north of Kentucky Highway 120, 400 feet west of U.S. Highway 41a.

[3] Karnak silty clay
0.5 mile north of Deer Creek, 300 feet east of U.S. Highway 41, 100 feet north of gravel road.

[4] Loring silt loam
0.4 southeast of Groves Chapel Church, north side of road.

[5] McGary silt loam
2 miles west of Kentucky Highway 109, 600 feet south of Kentucky Highway 143, 500 feet south of unsurfaced road.

[6] Memphis silt loam
1.2 miles southwest of junction of Kentucky Highway 56 and U.S. Highway 60, 400 feet north of U.S. Highway 60.

[7] Nolin silty clay loam
2.5 miles southwest of Shawneetown Bridge, 0.5 mile east of Ohio River.

[8] Uniontown silt loam
1,000 feet west of entrance to Camp Breckinridge, 500 feet south of U.S. Highway 60, 200 feet north of road.

[9] Wakeland silt loam: 0.5 mile south of junction of Kentucky Highway 492 and U.S. Highway 60, 300 feet east of U.S. Highway 60.

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Ashton	Fine-silty, mixed, mesic Mollic Hapludalfs
Belknap	Coarse-silty, mixed, acid, mesic Aeric Fluvaquents
Calloway	Fine-silty, mixed, thermic Glossaquic Fragiudalfs
Collins	Coarse-silty, mixed, acid, thermic Aquic Udifluvents
Frondorf	Fine-loamy, mixed, mesic Ultic Hapludalfs
Grenada	Fine-silty, mixed, thermic Glossic Fragiudalfs
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Henshaw	Fine-silty, mixed, mesic Aquic Hapludalfs
Huntington	Fine-silty, mixed, mesic Fluventic Hapludolls
*Karnak	Fine, montmorillonitic, nonacid, mesic Vertic Haplaquepts
Lindside	Fine-silty, mixed, mesic Fluvaquentic Eutrochrepts
Loring	Fine-silty, mixed, thermic Typic Fragiudalfs
Markland	Fine, mixed, mesic Typic Hapludalfs
*McGary	Fine, mixed, mesic Aeric Ochraqualfs
Melvin	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Memphis	Fine-silty, mixed, thermic Typic Hapludalfs
Newark	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Otwell	Fine-silty, mixed, mesic Typic Fragiudalfs
Patton	Fine-silty, mixed, mesic Typic Haplaquolls
Robinsonville	Coarse-loamy, mixed, nonacid, thermic Typic Udifluvents
Steinsburg	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Uniontown	Fine-silty, mixed, mesic Typic Hapludalfs
Wakeland	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
Waverly	Coarse-silty, mixed, acid, thermic Typic Fluvaquents
Weinbach	Fine-silty, mixed, mesic Aeric Fragiaqualfs
Wellston	Fine-silty, mixed, mesic Ultic Hapludalfs
Wheeling	Fine-loamy, mixed, mesic Ultic Hapludalfs
Wilbur	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents
Zanesville	Fine-silty, mixed, mesic Typic Fragiudalfs

☆U.S. GOVERNMENT PRINTING OFFICE: 1981—324-897/54

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

Nondiscrimination Statement

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for

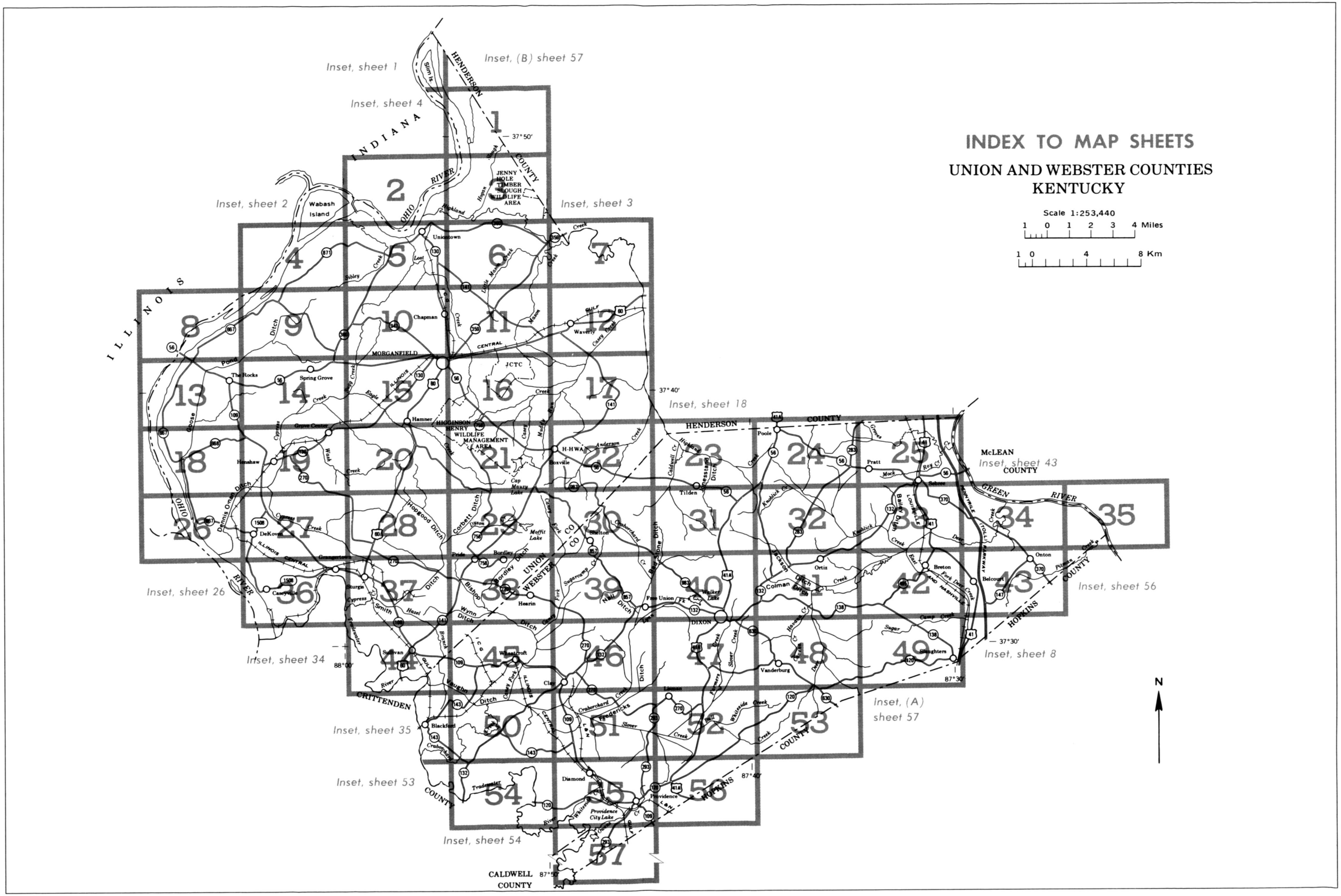
program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).



INDEX TO MAP SHEETS
UNION AND WEBSTER COUNTIES
KENTUCKY
Scale 1:253,440
1 0 1 2 3 4 Miles
1 0 4 8 Km
N
Inset, sheet 1
Inset, (B) sheet 57
Inset, sheet 4
Inset, sheet 2
Inset, sheet 3
Inset, sheet 18
Inset, sheet 43
Inset, sheet 26
Inset, sheet 56
Inset, sheet 34
Inset, sheet 8
Inset, (A) sheet 57
Inset, sheet 35
Inset, sheet 53
Inset, sheet 54
INDIANA
ILLINOIS
HENDERSON COUNTY
McLEAN COUNTY
HOPKINS COUNTY
CRITTENDEN COUNTY
CALDWELL COUNTY
UNION CO
WEBSTER CO
OHIO RIVER
GREEN RIVER
MORGANFIELD
DIXON
Uniontown
Chapman
Waverly
The Rocks
Spring Grove
Hamner
Grove Center
Henshaw
DeKoven
Grangertown
Sturgis
Caseyville
Sullivan
Wheatcroft
Clay
Blackford
Diamond
Providence
Pride
Bordley
Hearin
Shelton
Free Union
Tilden
Poole
Pratt
Sebree
Ortiz
Colman
Breton
Onton
Belcourt
Slaughters
Vanderburg
Lisman
JENNY HOLE TIMBER SLOUGH WILDLIFE AREA
HIGGINSON HENRY WILDLIFE MANAGEMENT AREA
JCTC
Wabash Island
Slim Is
Providence City Lake
Moffit Lake
Cap Maury Lake
37°50′
37°40′
37°30′
88°00′
87°30′
87°40′
87°50′
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57

SOIL LEGEND

The first letter, always a capital, is the initial letter of the soil name. The second letter is used to identify separate mapping units that begin with the same first letter. The third letter, if used, is a capital and connotes slope class. Symbols without a slope letter are nearly level, except for the Markland-Collins complex which has both steep and nearly level slopes, and Dumps, mine and Udorthents which have complex slope patterns. A final number, 3, in the symbol shows that the soil is severely eroded.

SYMBOL	NAME
As	Ashton silt loam
Bn	Belknap silt loam
Ca	Calloway silt loam
Co	Collins silt loam
Du	Dumps, mine
FdE	Frondorf silt loam, 20 to 30 percent slopes
GnB	Grenada silt loam, 2 to 6 percent slopes
Ha	Haymond silt loam
He	Henshaw silt loam
Hs	Huntington silt loam
Hu	Huntington-Robinsonville complex
Ka	Karnak silt loam, overwash
Kc	Karnak silty clay
Ld	Lindside silty clay loam
LoB	Loring silt loam, 2 to 6 percent slopes
LoC	Loring silt loam, 6 to 12 percent slopes
MaC	Markland silty clay loam, 6 to 12 percent slopes
Md	Markland-Collins complex
Mg	McGary silt loam
Mm	Melvin silty clay loam
Mn	Melvin silty clay loam, ponded
MoB	Memphis silt loam, 2 to 6 percent slopes
MoC	Memphis silt loam, 6 to 12 percent slopes
MpC3	Memphis silty clay loam, 6 to 12 percent slopes, severely eroded
MpD3	Memphis silty clay loam, 12 to 30 percent slopes, severely eroded
Ne	Newark silty clay loam
No	Nolin silty clay loam
OtA	Otwell silt loam, 0 to 2 percent slopes
OtB	Otwell silt loam, 2 to 6 percent slopes
Pa	Patton silt loam
Po	Patton silt loam, overwash
Ro	Robinsonville fine sandy loam
SnE	Steinsburg-Frondorf complex, 20 to 50 percent slopes
Ud	Udorthents, steep
UnA	Uniontown silt loam, 0 to 2 percent slopes
UnB	Uniontown silt loam, 2 to 6 percent slopes
UoC3	Uniontown silty clay loam, 6 to 12 percent slopes, severely eroded
Wa	Wakeland silt loam
Wb	Waverly silt loam
Wh	Weinbach silt loam
WlC	Wellston silt loam, 6 to 12 percent slopes
WlD	Wellston silt loam, 12 to 20 percent slopes
WpC3	Wellston silty clay loam, 6 to 12 percent slopes, severely eroded
WpD3	Wellston silty clay loam, 12 to 20 percent slopes, severely eroded
WsA	Wheeling silt loam, 0 to 2 percent slopes
WsB	Wheeling silt loam, 2 to 6 percent slopes
WtC3	Wheeling silty clay loam, 6 to 12 percent slopes, severely eroded
Wu	Wilbur silt loam
ZnC	Zanesville silt loam, 6 to 12 percent slopes
ZoC3	Zanesville silty clay loam, 6 to 12 percent slopes, severely eroded

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline
- AD HOC BOUNDARY (label)
- Small airport, airfield, park, oilfield, cemetery, or flood pool
- STATE COORDINATE TICK
- LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

- RAILROAD
- POWER TRANSMISSION LINE (normally not shown)
- PIPE LINE (normally not shown)
- FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

- SOIL DELINEATIONS AND SYMBOLS
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE SITE (normally not shown)
- MISCELLANEOUS
  - Blowout
  - Clay spot
  - Gravelly spot
  - Gumbo, slick or scabby spot (sodic)
  - Dumps and other similar non soil areas
  - Prominent hill or peak
  - Rock outcrop (includes sandstone and shale)
  - Saline spot
  - Sandy spot
  - Severely eroded spot
  - Slide or slip (tips point upslope)
  - Stony spot, very stony spot

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rahter than a basis for decisions on the use of specific tracts.

LEGEND*

1 NOLIN-HUNTINGTON-NEWARK: Deep, nearly level, well drained and somewhat poorly drained, medium textured and moderately fine textured soils; on flood plains

2 MELVIN-WHEELING: Deep, nearly level to gently sloping, poorly drained and well drained, moderately fine textured soils; on flood plains and stream terraces

3 MEMPHIS-WILBUR-WAKELAND: Deep, nearly level to steep, well drained to somewhat poorly drained, medium textured and moderately fine textured soils; on uplands and flood plains

4 PATTON-WILBUR-WAKELAND: Deep, nearly level, moderately well drained to poorly drained, medium textured soils; on flood plains and stream terraces

5 UNIONTOWN-PATTON-HENSHAW: Deep, nearly level to sloping, well drained to poorly drained, moderately fine textured soils; on stream terraces

6 MEMPHIS-WELLSTON: Deep, gently sloping to steep, well drained, moderately fine textured soils; on uplands

7 MCGARY-BELKNAP: Deep, nearly level, somewhat poorly drained, medium textured and fine textured soils; on flood plains and stream terraces

8 LORING-WELLSTON-ZANESVILLE: Deep, gently sloping to moderately steep, moderately well drained to well drained, moderately fine textured soils; on uplands

*Texture applies to the subsoil of the major soils.

Compiled 1980

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
KENTUCKY DEPARTMENT FOR NATURAL RESOURCES
AND ENVIRONMENTAL PROTECTION
KENTUCKY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

UNION COUNTY, KENTUCKY

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

LEGEND*

1 UNIONTOWN-PATTON-HENSHAW: Deep, nearly level to sloping, well drained to poorly drained, moderately fine textured soils; on stream terraces

2 LORING-GRENADA-CALLOWAY: Deep, nearly level to sloping, moderately well drained to somewhat poorly drained, medium textured and moderately fine textured soils that have a fragipan; on uplands

3 BELKNAP-WAVERLY: Deep, nearly level, somewhat poorly drained and poorly drained, medium textured soils; on flood plains

4 KARNAK-McGARY-BELKNAP: Deep, nearly level, somewhat poorly drained and poorly drained, medium textured and fine textured soils; on flood plains and stream terraces

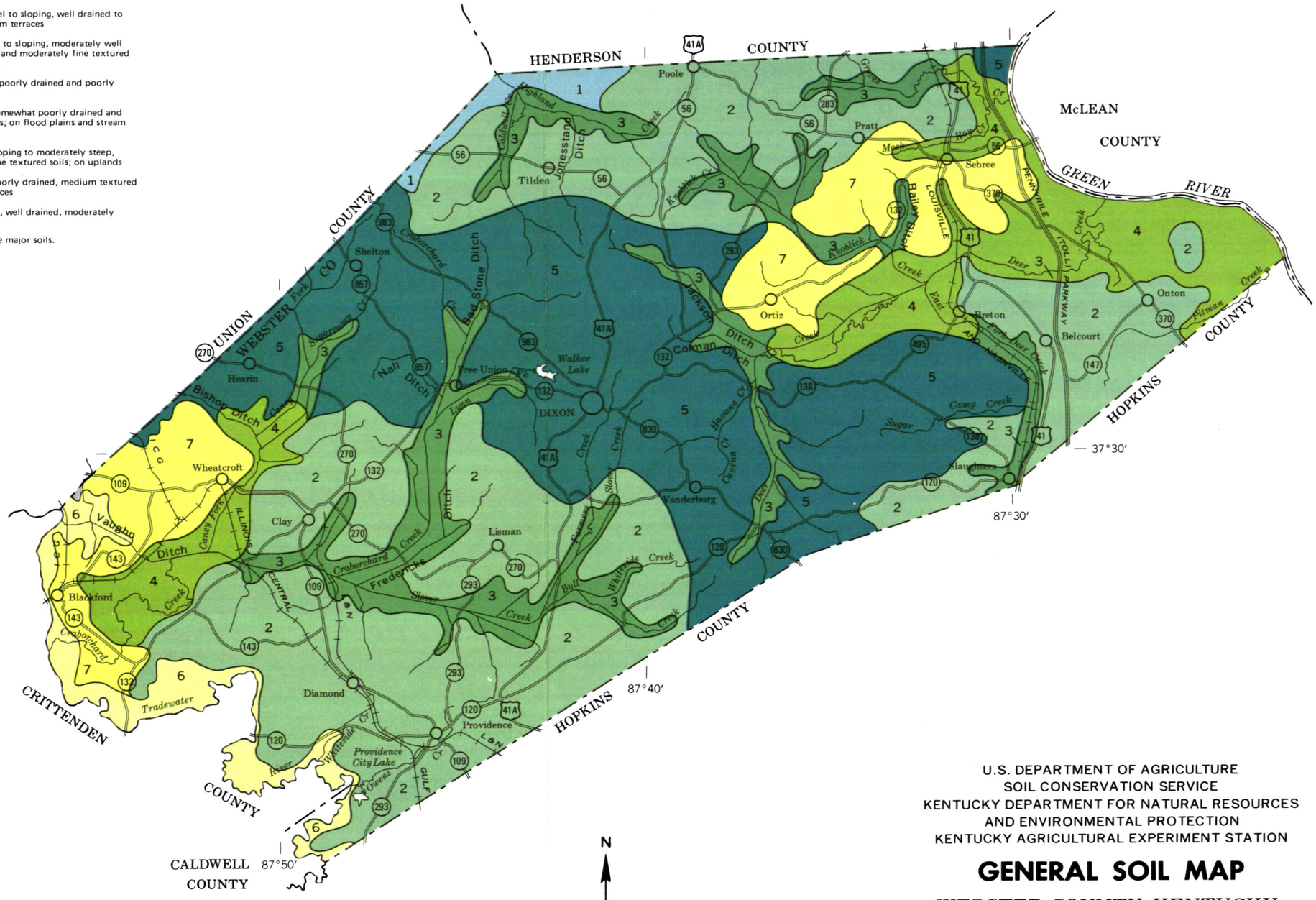
5 LORING-WELLSTON-ZANESVILLE: Deep, gently sloping to moderately steep, moderately well drained to well drained, moderately fine textured soils; on uplands

6 McGARY-BELKNAP: Deep, nearly level, somewhat poorly drained, medium textured and fine textured soils; on flood plains and stream terraces

7 MEMPHIS-WELLSTON: Deep, gently sloping to steep, well drained, moderately fine textured soils; on uplands

*Texture applies to the subsoil of the major soils.

Compiled 1980



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
KENTUCKY DEPARTMENT FOR NATURAL RESOURCES
AND ENVIRONMENTAL PROTECTION
KENTUCKY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

WEBSTER COUNTY, KENTUCKY

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 1

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(Joins inset B, sheet 57)

1 375 000 FEET

565 000 FEET

(Joins inset, sheet 4)

OHIO RIVER

POSEY COUNTY, INDIANA

HENDERSON COUNTY

Ro Island

Slim

Towhead Island Hu

Rattler Slough

Hogan Slough

(Joins sheet 3)

OtA

1 395 000 FEET

1 367 000 FEET

575 000 FEET

570 000 FEET

555 000 FEET

(Joins inset B, sheet 57)

(Joins inset, sheet 4)

1 370 000 FEET

3000 AND 5000-FOOT GRID TICKS

N

1 Mile

5 000 Feet

Scale 1:20000

N

1 Mile
5000 Feet

Scale · 1 : 20000

1 345 000 FEET

550 000 FEET

540 000 FEET

535 000 FEET

1 370 000 FEET

1 350 000 FEET

1 340 000 FEET

OHIO RIVER

POSEY COUNTY INDIANA

GALLATIN COUNTY ILLINOIS

INDIANA

DAM NO 49

WABASH ISLAND

Sibley

Highland Creek

Creek

Ro Hu Hs No Ld Ne Mm Wh OtA OtB As WsB MuD3 WtC3 Du MoB

(Joins upper right)

(Joins lower left)

(Joins sheet 3)

(Joins sheet 4)

(Joins sheet 5)

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 2

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 3

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 3

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 375 000 FEET

560 000 FEET

(Joins sheet 1)

(Joins sheet 2)

(Joins sheet 6) 1 395 000 FEET

(Joins inset) 535 000 FEET

OHIO RIVER

POSEY COUNTY INDIANA

HENDERSON COUNTY

Hogan Slough

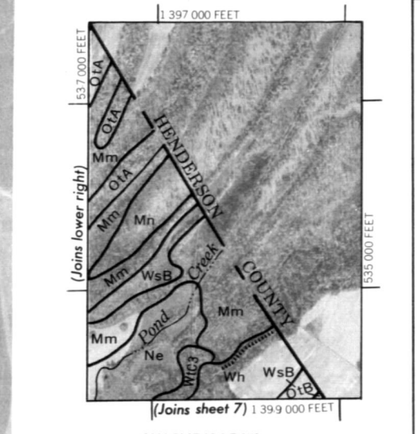
Highland Creek

Fishtrap Slough

Pond Creek

1637

Hs Hu Ro No Ne Mm As Ld WsA WsB OtA OtB Wh WtC3 MoB MpD3



N

1 Mile
5 000 Feet

Scale 1:20000

4

N

1 Mile
5 000 Feet
0 0
Scale · 1 : 20 000
¼ 1 000
½ 2 000
¾ 3 000
1 4 000
5 000

(Joins inset, sheet 1) 1 370 000 FEET

565 000 FEET

562 000 FEET

1 368 000 FEET

2000 AND 3000-FOOT GRID TICKS

(Joins inset, sheet 2) 1 345 000 FEET

530 000 FEET

520 000 FEET

1 325 000 FEET

(Joins sheet 5)

(Joins sheet 9)

OHIO RIVER

POSEY COUNTY

INDIANA

ILLINOIS

GALLATIN COUNTY

WABASH ISLAND

Slim Island

Grundy Hill

water

Hs Ro Ld Hu No Ne Wh WtC3 WsA WsB OtA Wu Mm MoB MoC MpD3 MpC3 Po OtB UdB Ud SnE

1671 871 666

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 4

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 5

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 350 000 FEET

(Joins sheet 2)

530 000 FEET

(Joins sheet 4)

OHIO RIVER

POSEY COUNTY INDIANA

UNIONTOWN

water

Sibley Creek

Clements Branch

Lost Creek

CENTRAL GULF

(Joins sheet 6)

520 000 FEET

(Joins sheet 10)

1 370 000 FEET

5

N

1 Mile

5000 Feet

Scale 1:20000

6

N

(Joins sheet 3)

1 395 000 FEET

530 000 FEET

520 000 FEET

(Joins sheet 11)

1 375 000 FEET

(Joins sheet 5)

(Joins sheet 7)

1 Mile

5000 Feet

Scale 1:20000

0 0 1000 2000 3000 4000 5000

¼ ½ ¾ 1

Lost Creek

Pond Creek

Mason Creek

Little Creek

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 6

(Joins inset, sheet 3)

(Joins sheet 6)

(Joins sheet 12)

1 400 000 FEET

530 000 FEET

520 000 FEET

1 420 000 FEET

HENDERSON COUNTY

HIGHLAND CREEK

Hitesville

Mud Creek

Pond Cr

7

N

1 Mile

5 000 Feet

Scale 1:20000

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 7

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

8

N

1 Mile
5000 Feet
0
0
Scale 1:20000
1/4 1000
1/2 2000
3/4 3000
4000
5000

1 320 000 FEET
515 000 FEET
505 000 FEET
1 300 000 FEET
430 000 FEET
1 495 000 FEET
1 505 000 FEET
435 000 FEET

(Joins sheet 43)
(Joins sheet 49)
(Joins sheet 9)
(Joins sheet 13)

HOPKINS COUNTY
UNION COUNTY
ILLINOIS
KENTUCKY
GALLATIN COUNTY

O H I O R I V E R

Bell Island
Blackburn

Sugar Camp Cr
East Fork Deer Creek
AND LOUISVILLE NASHVILLE
PENNYRILE PARKWAY

LoC WlD WpD3 ZoC3 GnB LoB Bn Co Ca FdE Ud WlC SnE Hu No Hs Ro Ld Mn Ne

41 56 667

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 8

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 9
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 325 000 FEET

515 000 FEET

GALLATIN COUNTY — ILLINOIS

OHIO RIVER

Bell Island

Raleigh

(Joins sheet 4)

(Joins sheet 8)

(Joins sheet 10)

(Joins sheet 14)

1 345 000 FEET

505 000 FEET

9

N

1 Mile

5000 Feet

Scale 1:20000

water

DITCH

POND

GOOSE

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 10

10

N

(Joins sheet 5)

1 370 000 FEET

505 000 FEET

(Joins sheet 9)

(Joins sheet 11)

(Joins sheet 15)

1 350 000 FEET

1 Mile

5000 Feet

Scale 1:20000

Clements Branch

WATHEN DITCH

ILL CENTRAL GULF

MORGANFIELD (county seat)

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 10

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 11

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and division corners, if shown, are approximately positioned.

(Joins sheet 10)

1 375 000 FEET

515 000 FEET

(Joins sheet 6)

(Joins sheet 12)

505 000 FEET

(Joins sheet 16)

1 395 000 FEET

11

N

1 Mile

5000 Feet

Scale 1:20000

MORGANFIELD

Flournoy

St Vincent

BRECKINRIDGE JOB CORPS CENTER

Mason Creek

Little Mason Creek

Lost Creek

Higginson Creek

WATHEN DITCH

CENTRAL GULF

ILLINOIS

N

(Joins sheet 7)

1 420 000 FEET

515 000 FEET

505 000 FEET

1 400 000 FEET

(Joins sheet 17)

1 Mile
5 000 Feet

Scale 1:20000

(Joins sheet 11)

Waverly

Casey Creek

GULF CENTRAL ILLINOIS

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 12

HENDERSON COUNTY

HIGHLAND CREEK

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 13

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 300 000 FEET

500 000 FEET

(Joins sheet 8)

OHIO RIVER

GALLATIN COUNTY ILLINOIS

Muddy Pond

Long Pond

Dixon Pond

Geiger Lake

GOOSE POND DITCH

The Rocks

(Joins sheet 18)

(Joins sheet 14)

1 320 000 FEET

490 000 FEET

13

N

1 Mile

5000 Feet

Scale 1:20000

1 0 ¼ ½ ¾ 1

5000 0 1000 2000 3000 4000

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land divisions, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 14

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 15

This map is compiled on 1375 aerial photography by the U. S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximatery positioned.

1 350 000 FEET

500 000 FEET

(Joins sheet 10)

(Joins sheet 14)

(Joins sheet 16)

(Joins sheet 20)

1 370 000 FEET

MORGANFIELD
County seat

Cypress Flats

Harding

Hamner

water

Cypress Creek

Eagle Creek

Sugg Creek

Wa Creek

CENTRAL ILLINOIS GULF

15

N

1 Mile
5000 Feet

Scale 1:20000

1 0 1 2 3 4 5000 1000 2000 3000 4000

N

(Joins sheet 11)

1 395 000 FEET

500 000 FEET

MORGANFIELD
(county seat)

CENTRAL

ILLINOIS

GULF

Creek

Lost

water

Morganfield
Landing Strip

BRECKINRIDGE JOB CORPS CENTER

Chalybeate Hills

HIGGINSON-HENRY WILDLIFE MANAGEMENT AREA

Casey Creek

490 000 FEET

1 375 000 FEET

(Joins sheet 21)

(Joins sheet 17)

1 Mile
5000 Feet

Scale 1:20000

(Joins sheet 15)

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 16

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 17

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 400 000 FEET

500 000 FEET

(Joins sheet 12)

(Joins sheet 16)

(Joins inset, sheet 18)

(Joins sheet 22)

485 000 FEET

1 420 000 FEET

17

N

1 Mile

5000 Feet

Scale 1:20000

1 000 2 000 3 000 4 000 5 000

Casey Creek

Muddy Run

water

HIGHLAND CREEK

HENDERSON COUNTY

Anderson Cr

(18)

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 18

N

Scale 1:20000

1 Mile — 0 — ¼ — ½ — ¾ — 1

5000 Feet — 0 — 1000 — 2000 — 3000 — 4000 — 5000

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 18

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 19

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 20

20

N

(Joins sheet 15)

1 370 000 FEET

485 000 FEET

1 Mile

5000 Feet

Scale 1:20000

(Joins sheet 19)

Dyer Hills

Eagle Creek

HIGGINSON-HENRY WILDLIFE MANAGEMENT AREA

Wash Creek

470 000 FEET

1 350 000 FEET

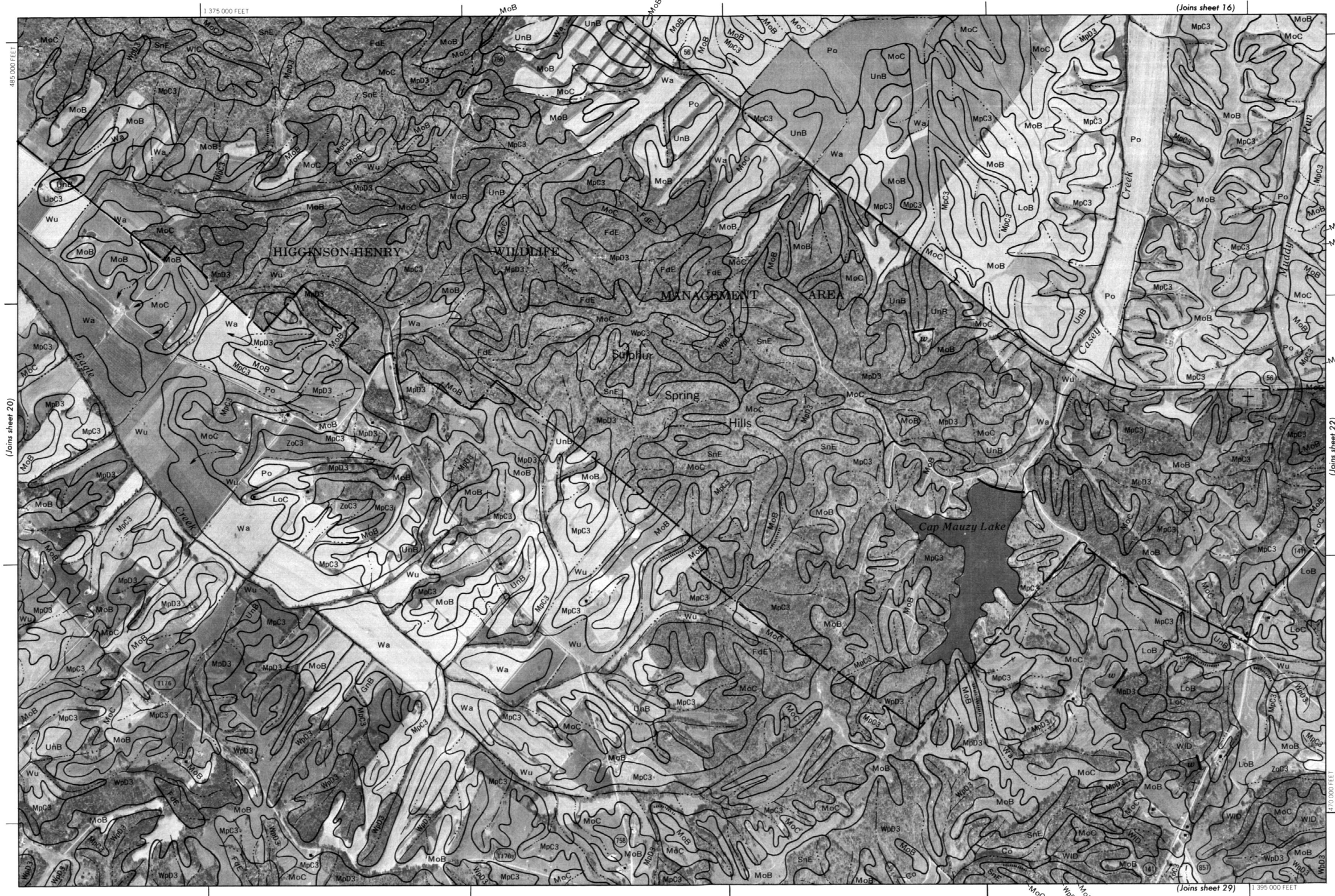
(Joins sheet 28)

(Joins sheet 21)

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 20

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 21



UNION AND WEBSTER COUNTIES, KENTUCKY NO. 21

This map is compiled on 1954 aerial photography by the U. S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

Scale 1:20000

1 Mile

5 000 Feet

0

1/4 1/2 3/4 1

1 000 2 000 3 000 4 000 5 000

(Joins sheet 17)

(Joins sheet 21)

(Joins sheet 23)

(Joins sheet 30)

1 420 000 FEET

485 000 FEET

1 400 000 FEET

470 000 FEET

Boxville

HIGGINSON-HENRY WILDLIFE MANAGEMENT AREA

Springer Hill

Givens

WEBSTER COUNTY

UNION COUNTY

Muddy Run

Anderson Creek

water

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 22

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 23

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 23

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(Joins inset, sheet 18)

1 425 000 FEET

485 000 FEET

(Joins sheet 22)

HENDERSON COUNTY

UNION COUNTY

WEBSTER COUNTY

Whitelick Creek

Caldwell Creek

Highland Creek

Highland Creek

FORK DITCH

JONESSTAND DITCH

Wa Wb Wu Ca Bn Co He

MpC3 MpD3 MoB MoC GnB LoB LoC UnB WpD3 ZoC3 FdE

(Joins sheet 24)

(Joins sheet 31)

1 445 000 FEET

470 000 FEET

23

N

1 Mile

5000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

24

N

1 Mile

5000 Feet

Scale · 1:20000

1 470 000 FEET

485 000 FEET

HENDERSON COUNTY

Poole

Highland Creek

(Joins sheet 23)

(Joins sheet 25)

(Joins sheet 32)

1 450 000 FEET

470 000 FEET

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 24

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 25

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 25

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 470 000 FEET

485 000 FEET

HENDERSON COUNTY

OHIO RIVER

McLEAN COUNTY

GREEN

Creek

GROVES

LOUISVILLE

NASHVILLE

FORE

CREEK

FERNVALE

PARKWAY

Mock

Roy

Creek

SEBREE

Pratt

water

(Joins sheet 24)

(Joins inset, sheet 43)

(Joins sheet 33)

1 490 000 FEET

470 000 FEET

25

N

1 Mile

5000 Feet

Scale 1:20000

26

N

1 Mile
5000 Feet

0 0

Scale 1:20000

1 | 5 000 | ¼ | 1 000 | ½ | 2 000 | ¾ | 4 000 | 3 000

(Joins sheet 18)

1 320 000 FEET

465 000 FEET

(Joins sheet 27)

(Joins lower right)

1 320 000 FEET

450 000 FEET

(Joins sheet 36)

446 000 FEET

1 318 000 FEET

455 000 FEET

1 300 000 FEET

(Joins inset)

2000 AND 4000-FOOT GRID TICKS

GALLATIN COUNTY ILLINOIS

OHIO RIVER

HARDIN COUNTY ILLINOIS

GOOSE POND DITCH

O'NAN DITCH

DENNIS ILLINOIS CENTRAL GULF

SALINE RIVER

Sturgeon Island

water

Ld Ne Mm OtB OtA Wh WsB Mg Du Wu MoC MoD3 No Ro Hs Hu Wa SnE

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 26

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 27

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 325 000 FEET

465 000 FEET

(Joins sheet 19)

(Joins sheet 26)

(Joins sheet 28)

(Joins sheet 36)

1 345 000 FEET

455 000 FEET

27

N

1 Mile

5000 Feet

Scale 1:20000

Graham Hill

Paris Hills

Dodge Hills

Dekoven

Curlew

Indian Hill

Sturgis

Cypress Creek

ILLINOIS CENTRAL GULF

28

N

(Joins sheet 20)

1 370 000 FEET

455 000 FEET

(Joins sheet 29)

(Joins sheet 27)

(Joins sheet 37)

1 350 000 FEET

Scale 1:20000

1 Mile

5000 Feet

Kern Orchard

Blueberry Hill

Cypress Creek

HOPSGOOD DITCH

SMITH DITCH

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 28

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 29

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 29

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

29

N

Scale 1:20000

1 Mile

5000 Feet

1 375 000 FEET

465 000 FEET

455 000 FEET

1 395 000 FEET

(Joins sheet 28)

(Joins sheet 21)

(Joins sheet 30)

(Joins sheet 38)

Holeman Hill

Cullen

Arnold

Pride

Dyson Creek

Moffit Lake

Ridge

water

CORBETT DITCH

HORSCOOP DITCH

30

N

(Joins sheet 22)

1 420 000 FEET

Persimmon Ridge

UNION COUNTY — WEBSTER COUNTY

Caney Fork

Shelton

Cruthersburg Creek

(Joins sheet 29)

(Joins sheet 31)

(Joins sheet 39)

1 400 000 FEET

465 000 FEET

Scale 1:20000

1 Mile

5000 Feet

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

This map is compiled on 1:15 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 30

N

1 425 000 FEET

465 000 FEET

(Joins sheet 23)

(Joins sheet 30)

(Joins sheet 32)

(Joins sheet 40)

1 445 000 FEET

455 000 FEET

Tilden

Caldwell Creek

JONESTAND DITCH

1 Mile

5000 Feet

Scale 1:20000

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 31

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

32

N

(Joins sheet 24)

1 470 000 FEET

465 000 FEET

1 Mile

5000 Feet

Scale · 1:20000

(Joins sheet 31)

(Joins sheet 33)

455 000 FEET

(Joins sheet 41)

1 450 000 FEET

Wanamaker

Knoblick Creek

MELTON DITCH

Beal Hill

Bald Knob

Knoblick Creek

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 32

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 33

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 470 000 FEET

465 000 FEET

(Joins sheet 25)

(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 42)

1 490 000 FEET

455 000 FEET

Steamport Hill

SEBREE

Knoblick Creek

Creek

BAILEY DITCH

LOUISVILLE AND NASHVILLE

PENNYRILE PARKWAY

1 Mile

5000 Feet

Scale 1:20000

33

N

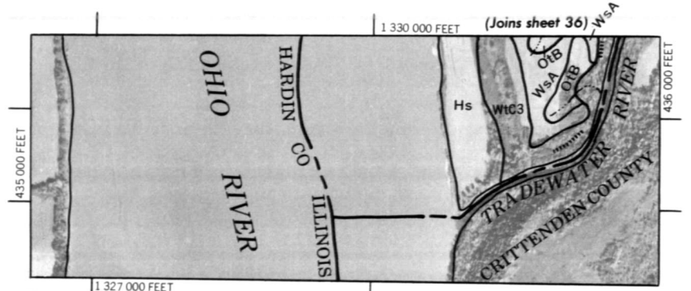
N

1 Mile 5000 Feet

Scale 1:20000

(Joins inset, sheet 43)

1 515 000 FEET



GREEN RIVER

MCLEAN COUNTY

Roland Landing

Stearnport Landing

Deer Creek

PENNYRILE PARKWAY

(Joins sheet 33)

(Joins sheet 35)

1 495 000 FEET

(Joins sheet 43)

455 000 FEET

465 000 FEET

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 34

1 520 000 FEET

465 000 FEET

455 000 FEET

1 530 000 FEET

(Joins sheet 34)

(Joins inset, sheet 56)

1 365 000 FEET

420 000 FEET

405 000 FEET

1 370 000 FEET

(Joins sheet 44)

(Joins sheet 50)

(Joins inset, sheet 53)

GREEN RIVER

MCLEAN COUNTY

HOPKINS COUNTY

TRADEWATER RIVER

UNION COUNTY

CENTRAL ILLINOIS GULF

Blackford

Cobblers Knob

Cradorhard

35

N

1 Mile

5000 Feet

Scale 1:20000

36

N

(Joins sheet 27)

(Joins inset, sheet 26)

(Joins sheet 37)

(Joins inset, sheet 34)

1 345 000 FEET

1 325 000 FEET

440 000 FEET

450 000 FEET

Scale 1:20000

1 Mile 5000 Feet

0 0

1/4 1000

1/2 2000

3/4 3000

1 4000

5000

Mulfordtown

Caseyville

Grangertown

Sturgeon Island

OHIO RIVER

HARDIN COUNTY ILLINOIS

ILLINOIS CENTRAL GULF

TRADEWATER RIVER

CRITTENDEN COUNTY

Ro Hs No Ha Wu UnA UnB MpC3 MpD3 MoB MoC WpD3 SnE WtC3 WsB WsA OtB MaC FdE UoC3 Mg Wa Ne Mn Ld Po Pa He Kc Wh

1508 109 923

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY SHEET NO. 36

1 350 000 FEET

(Joins sheet 36)

450 000 FEET

(Joins sheet 28)

37

N

1 Mile

5000 Feet

Scale 1:20000

(Joins sheet 38)

440 000 FEET

(Joins sheet 44)

1 370 000 FEET

STURGIS

STURGIS AIRPORT

CRITTENDEN COUNTY

TRADEWATER

Cypress

Hazel

Branch

ILLINOIS CENTRAL GULF

SMITH

DITCH

water

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 38

38

N

(Joins sheet 29)

1 395 000 FEET

450 000 FEET

Scale 1:20000

1 Mile

5 000 Feet

(Joins sheet 37)

(Joins sheet 39)

440 000 FEET

(Joins sheet 45)

1 375 000 FEET

Pride

Bordley

Hearin

Williams

BORDLEY DITCH

BISHOP DITCH

WYNN DITCH

UNION COUNTY

WEBSTER COUNTY

Water

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 400 000 FEET

450 000 FEET

(Joins sheet 30)

(Joins sheet 38)

(Joins sheet 40)

(Joins sheet 46)

1 420 000 FEET

440 000 FEET

39

N

Scale 1:20000

1 Mile

5000 Feet

Free Union

Camp Creek

Sugar Creek

Caney Fork

Craborchard Creek

Lynn Fork

UNION

WEBSTER CO

40

N

Scale 1:20000

1 Mile 5000 Feet

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

(Joins sheet 31)

(Joins sheet 39)

(Joins sheet 41)

(Joins sheet 47)

1 445 000 FEET

450 000 FEET

440 000 FEET

1 425 000 FEET

Little Zion

Walker Lake

Fork

Lynn

Cutlorchard Cr

Dixon
county seat

water

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 41

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 450 000 FEET

450 000 FEET

(Joins sheet 40)

(Joins sheet 32)

(Joins sheet 42)

(Joins sheet 48)

1 470 000 FEET

440 000 FEET

N

1 Mile

5000 Feet

Scale 1:20000

JACKSON

DITCH

COLMAN

Creek

Deer

Hawnee

Ortiz

Catesville

water

42

N

(Joins sheet 33)

1 490 000 FEET

450 000 FEET

Scale 1:20000

1 Mile

5000 Feet

(Joins sheet 41)

440 000 FEET

1 470 000 FEET

(Joins sheet 49)

(Joins sheet 43)

Deer Creek

East Fork Deer Creek

Louisville

Nashville

Breton

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 42

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 43

This map is compiled on 1979 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 495 000 FEET

450 000 FEET

(Joins sheet 34)

(Joins sheet 42)

(Joins inset, sheet 8)

1 515 000 FEET

N

(Joins inset, sheet 56)

1 Mile

5 000 Feet

Scale 1:20000

1 000 0 0 1 000

¼ 2 000

⅓ 3 000

¾ 4 000

1 5 000

440 000 FEET

470 000 FEET

Onton

Pitman Creek

PENNYRILE PARKWAY

East Fork Deer Creek

Elmwood

LOUISVILLE AND NASHVILLE

HOPKINS COUNTY

GREEN RIVER

McLEAN COUNTY

water

2000 AND 3000-FOOT GRID TICKS

1 495 000 FEET

473 000 FEET

(Joins sheet 25)

(Joins sheet 34) 1 497 000 FEET

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 44

44

N

Scale · 1 : 20000

1 Mile 5 000 Feet

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

1 370 000 FEET

435 000 FEET

425 000 FEET

1 350 000 FEET

(Joins sheet 37)

(Joins sheet 45)

(Joins inset, sheet 35)

Carding Machine Hill

McGraw Hill

Gilchrist Bend

Sullivan

Hazel Branch

ILLINOIS CENTRAL RAILROAD

CRITTENDEN COUNTY

UNION COUNTY

WEBSTER COUNTY

TRADEWATER RIVER

VAUGHN DITCH

water

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 44

N

1 375 000 FEET

435 000 FEET

(Joins sheet 38)

(Joins sheet 44)

(Joins sheet 46)

(Joins sheet 50)

1 395 000 FEET

420 000 FEET

UNION COUNTY

WEBSTER COUNTY

Hudson Hill

Rock Spring

Wheatcroft

West Wheatcroft

Grammy Hill

Caney Fork

Pitch

Bishop

Vaughn Ditch

Gulf Central Illinois

1 Mile

5000 Feet

Scale 1:20000

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 45

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 46

46

N

Scale · 1 : 20000

1 Mile

5000 Feet

(Joins sheet 39)

(Joins sheet 45)

(Joins sheet 47)

(Joins sheet 51)

1 420 000 FEET

1 400 000 FEET

435 000 FEET

420 000 FEET

Craborchard Creek

ILLINOIS CENTRAL GULF

LOUISVILLE AND NASHVILLE

CLARK FORK DITCH

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 46

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 47

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 47

This map is compiled on 1972 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 425 000 FEET

435 000 FEET

(Joins sheet 46)

(Joins sheet 40)

(Joins sheet 48)

(Joins sheet 52)

1 445 000 FEET

420 000 FEET

Dixon
(County seat)

Farmers Creek

Slover Creek

47

N

1 Mile

5000 Feet

Scale 1:20000

N

Scale 1:20000

1 Mile

5 000 Feet

(Joins sheet 41)

(Joins sheet 47)

(Joins sheet 49)

(Joins sheet 53)

1 470 000 FEET

435 000 FEET

420 000 FEET

Havana Creek

Deer Creek

Cavana Creek

Caseyville

Vanderburg

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 48

N

1 470 000 FEET

435 000 FEET

(Joins sheet 42)

(Joins sheet 48)

(Joins inset, sheet 8)

(Joins inset A, sheet 57)

1 490 000 FEET

420 000 FEET

Sugar Camp Creek

Pond Fork Pear Creek

LOUISVILLE AND NASHVILLE

Slaughters

HOPKINS COUNTY

1 Mile

5,000 Feet

Scale 1:20000

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 49

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

50

UNION AND WEBSTER COUNTIES, KENTUCKY — SHEET NUMBER 50

(Joins sheet 45)

N

1 Mile
5000 Feet

Scale 1:20000

(Joins inset, sheet 35)

1 395 000 FEET

420 000 FEET

405 000 FEET

(Joins sheet 54)

1 375 000 FEET

(Joins sheet 51)

Virginia
Derby
Fairmont
Craborchard
Cane Fork
Creek
Mac Creek
VAUGHN
GULF
CENTRAL
ILLINOIS
DITCH

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 50

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 51

This map was compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(Joins sheet 46)
(Joins sheet 50)
(Joins sheet 52)
(Joins sheet 55)

1 400 000 FEET
420 000 FEET
1 420 000 FEET
405 000 FEET

Nesbit Hill
Clifty Hill
Craborchard Creek
Slover Creek
FREDRICKS DITCH
LOUISVILLE
NASHVILLE
ILLINOIS CENTRAL GULF
water

LoB WpD3 ZoC3 GnB LoC Bn Wb Ka Kc Co Ca Ud FdE MoB MoC WlD ZnC Mg Mn MpC3 SnE

N

1 Mile
5000 Feet
Scale 1:20000

N

1 Mile

5000 Feet

Scale 1:20000

(Joins sheet 47)

(Joins sheet 51)

(Joins sheet 53)

(Joins sheet 56)

1 445 000 FEET

420 000 FEET

405 000 FEET

1 425 000 FEET

Lisman

Jolly

Stanhope

Farmers Creek

Slover Creek

Whiteside Creek

Bull Creek

BAKER DITCH

HOPKINS CO

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 52

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 53

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 450 000 FEET

420 000 FEET

(Joins sheet 48)

(Joins inset A, sheet 57)

(Joins sheet 52)

DEER CREEK

HOPKINS COUNTY

Bull Creek

(Joins inset, sheet 35)

1 365 000 FEET

403 000 FEET

TRADEWATER RIVER

CRITTENDEN COUNTY

(Joins sheet 54)

400 000 FEET

405 000 FEET

3000 AND 5000-FOOT GRID TICKS

1 370 000 FEET

1 465 000 FEET

53

N

1 Mile

5000 Feet

Scale 1:20000

54

N

(Joins sheet 50)

(Joins inset, sheet 53)

1 395 000 FEET

400 000 FEET

CRITTENDEN CO

CRITTENDEN COUNTY

TRADEWATER RIVER

Black Rough Bottom

(Joins sheet 55)

(Joins lower right)

(55)

385 000 FEET

387 000 FEET

1 390 000 FEET

2000 AND 5000-FOOT GRID TICKS

390 000 FEET

1 375 000 FEET

(Joins inset)

1 Mile

5000 Feet

Scale 1 : 20000

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 54

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 55

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(Joins sheet 54)
(Joins sheet 51)
(Joins sheet 56)
(Joins sheet 57)

1 400 000 FEET
400 000 FEET
1 420 000 FEET
390 000 FEET

Diamond
Green Grove Hill
PROVIDENCE
Bellville
ILLINOIS CENTRAL GULF
Whitesside Creek
TRADEWATER RIVER
CRITTENDEN COUNTY
HOPKINS COUNTY
NASHVILLE

N

1 Mile
5000 Feet
Scale 1:20000

N

Scale 1:20000

1 Mile 5,000 Feet

0 0 ¼ 1000 ½ 2000 ¾ 3000 1 4000 5000

(Joins sheet 52)

(Joins sheet 55)

(Joins sheet 35)

(Joins sheet 43)

1 445 000 FEET

400 000 FEET

390 000 FEET

1 425 000 FEET

1 525 000 FEET

450 000 FEET

446 000 FEET

1 520 000 FEET

4000 AND 5000-FOOT GRID TICKS

HOPKINS COUNTY

Co ZoC3 GnB LoB Ca Bn Wb WlD WpD3 LoC Du Ud Ka Kc MaC Mg Md FdE water

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid (UTM) and land division corners, if shown, are approximately positioned.

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 56

UNION AND WEBSTER COUNTIES, KENTUCKY NO. 57

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

57

N

1 400 000 FEET

(Joins sheet 55)

(Joins inset, sheet 54)

385 000 FEET

Providence City Lake

CRITTENDEN COUNTY

TRADEWATER RIVER

CALDWELL COUNTY

HOPKINS COUNTY

INSET A

1 470 000 FEET

(Joins sheet 49)

(Joins sheet 53) 420 000 FEET

418 000 FEET

2000 AND 5000-FOOT GRID TICKS

1 475 000 FEET

INSET B

1 375 000 FEET

575 000 FEET

(Joins inset, sheet 1)

OHIO RIVER

HENDERSON COUNTY

Slim Island

570 000 FEET

375 000 FEET

(Joins sheet 1)

1 379 000 FEET

4000 AND 5000-FOOT GRID TICKS

1 420 000 FEET

1 Mile

5 000 Feet

Scale 1:20000